

Facilitating Descriptions for Unattended Persons:  
The quality of person descriptions from recall memory following  
inattentive encoding and facilitation of inattentive memory.

A thesis submitted in partial fulfilment of  
the requirements of the degree of Doctor of Philosophy

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May 2019  
Word count =

## Declaration of Authorship

I, Ashleigh McGregor, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: A. McGregor

A black rectangular box redacting the signature of the author.

Date: 31/05/2019

## Abstract

Psychological research has provided valuable insight into the reliability of eyewitness memory, advising how best to elicit target information and predicting when errors are most likely. However, most research-based recommendations are based on the performance of 'attentive' witnesses, who were aware that the stimuli held some level of importance, or who have paid deliberate attention during encoding. In contrast, comparisons of 'attentive' and 'inattentive' witnesses are less frequent. Inattentive witnesses; those who are unaware they had experienced anything of significance, may not have paid any deliberate attention during encoding. The current thesis aims to examine the amount and accuracy of information reported from witnesses following 'attentive' and 'inattentive' encoding. Furthermore, it will examine the extent to which techniques that facilitate retrieval can support witnesses in their retrieval attempts following inattentive encoding.

Experiment 1 makes use of a dual task paradigm to examine recall of perpetrator descriptions following the viewing of a mock crime under divided or full attention conditions. A word generation was used to represent a passer-by witness engaging in internal thought unrelated to the incident of interest during the encoding experience. A bag theft scenario was used in the stimulus video while a word generation task was used to divide attention in half of participants. Following a 2-week delay phase, participant recollections were obtained using either a Free Recall (FR) or Mental Reinstatement of Context task (MRC). There were no significant differences in amount of target descriptors recalled or their accuracy, with a floor effect observed in the amount of details provided, suggesting that inattentive and attentive memories are equally incomplete over a delay. However, manipulation checks suggest experimental limitations in relation to the delay phase resulting in floor level recall across conditions. In addition, a manipulation check revealed no correlation between distractor task performance and recall task performance. These issues were addressed through changes to the paradigm used in follow up experiments. However, it remains possible that with an immediate test the divided attention paradigm may be useful in future research.

In Experiment 2 participants were either aware that they were witnessing an incident they would be asked to recall (attentive condition) or unaware of the situation (inattentive condition). A paradigm similar to that used in incidental learning research was used to manipulate attentional focus to investigate the resulting recall of mock witness participants.

Attentive participants were made aware that they were witnessing an incident of importance being asked to attend to and remember the target (perpetrator) said to be using a stolen bank card, while inattentive participants were unaware of the relevance of the target. In this way attentional focus was manipulated in both a within and between-subjects manner. After viewing the ambiguous video clip of a queue at a bank teller's window participants were then asked to report their memories for both the attended target character and a non-target bystander by completed either a FR task or a Self-Administered Interview (SAI). Findings show that attentive participants recalled more information about the perpetrator and bystander overall and that the SAI was found to be more effective in facilitating memory than FR. In addition, inattentive participants were able to provide more details about the non-target bystander than attentive participants who were asked to focus their attention on the target participant. No differences in accuracy of person descriptors recalled were found.

Experiment 3, using a within-subjects paradigm similar to that used in Experiment 2, examined memories for attended and non-attended targets following short live interactions with two confederates. Attentional focus was manipulated via instructions delivered during the interaction with an attended target confederate. Participants then reported memories for both the attended target and unattended non-target confederate who participants were exposed to without interaction using a FR task (FR), Disaster Victim information form (DVI) or a novel technique developed for this experiment, the Form for Individualised Descriptions (FIND). Results show a significant main effect of attention instruction with target recall being higher than non-target recall. Accuracy was found to significantly differ with the attended target being recalled more accurately than the non-attended target while no significant accuracy differences were evident between retrieval conditions. In addition, the quantity of information gained was highest in the DVI condition followed by the FIND condition while the FR obtained the lowest number of details. Accuracy was found to be highest in the FR condition, followed by the FIND with lower accuracy levels being observed in the DVI condition. It was therefore concluded that the FIND was the optimum method of the three examined for use with both attentive and inattentive participants.

Finally, Experiment 4 made use of a similar paradigm to experiments 1 and 2 regarding stimuli presentation. Participants viewed an ambiguous video with a scene inserted to manipulate attentional focus and were then asked to report their memories of the target

person using a FR initially followed by an MRC task, which aimed to elicit additional information above the baseline obtained in the FR. It was found that more coarse than fine grain information was recalled overall, but the patterns did not vary significantly across encoding conditions (attentive and inattentive). Attentive and inattentive participants' ability to provide person descriptions in both an initial FR as well as the ability to provide additional details in a follow up MRC was also examined with additional coding examining participants' ability to provide fine and coarse grain details. It was found that more coarse grain than fine grain information was recalled overall, but the patterns did not vary significantly across encoding conditions (attentive and inattentive).

Collectively these studies indicate that witnesses can produce useful information when retrieval is facilitated appropriately. The implications of these findings for the criminal justice system as well as theoretical cognitive explanations are discussed.

Key words:

Inattentive memory, Attentional Focus, Episodic Buffer, Spreading Activation, Encoding Specificity, Levels of processing, Memory facilitation.

## Acknowledgements

*"Find a group of people who challenge and inspire you, spend a lot of time with them, and it will change your life." – Amy Poehler*

Thank you to my supervisors; Prof. Fiona Gabbert, Dr. David La Rooy, Dr. Sheila Cunningham, and Dr. Ken Scott Brown for all their contributions of time, advice and mentorship during my studies. Thank you for showing patience with me in hard times and for pushing me to achieve my goals. You have all helped to guide me and have shaped me as a researcher; I appreciate all the effort and time you have dedicated to these projects and it has been a great experience working with each of you. I also thank each of you for the opportunities and mentorship you have provided me at various stages.

I would also like to extend my thanks to the Department of Psychology of Abertay University especially to both my current supervision team Dr. Sheila Cunningham and Dr. Ken Scott Brown as well as to Dr. Lynn, Wright, Noelle McAra, and Dr. Siobhan McAndrew for their support and guidance.

I would like to thank those practitioners and academics from external institutions who took the time to discuss with me my ideas and findings as well as answer my questions. The advice I received and the knowledge I gained through these personal communications has been invaluable and has profoundly influenced the design of materials described within the current thesis. I would especially like to thank the following organisations for their collaborative outlook: Greater Manchester Police, Hampshire Constabulary, Thames Valley Police, and Police Scotland.

In addition, I would like to thank the following individuals for their influential advice: Laura Hynes, Ian Hynes, Mick Comfrey, Dr. Laura Farrugia, Dr. Melanie Douglas, Dr. Jeunese Payne, Prof. Lorraine Hope, Dr. Gordon Wright, Prof. Gavin Oxborough, Dr. Jan Bikker, Prof. Amina Memon, Prof. Becky Milne, and Prof. Coral Dando.

Thank you for the contributions of the Abertay Eyewitness Lab members: Sarah Firth, Kirsten Lindsay, Mark Adams, Marissa Matteo, Corrie Tadden-Patterson and Rachel Milne. Thank you especially to those who took on roles in Experiment 3, the dedication and commitment shown by each of you made this possible. Thank you to the Abertay Drama

Society for their help in creating, scripting, directing and filming video clips for some of the studies contained in this thesis. With special thanks to Andy for his role as expert cameraman.

I would like to take this opportunity to thank both the Research degrees training sub-committee and the International Investigative Interviewing Research Group for their financial support, allowing me to attend some of the most widely recognised and well attended international conferences directly related to my studies (i.e., iIIRG and SARMAC). Thanks to this funding I was able to meet with experts in my field of interest and discuss my research findings with them, thus providing me with feedback on my findings and leading to collaborations. Thanks especially to those collaborators who advised on this thesis; Dr. James Sauer, Prof. Tim Valentine, Dr. Jan Bikker, Dr. Mark Adams. Sarah Firth and Prof. Fiona Gabbert.

Thank you to my family and friends for your support and your understanding. Special thanks to my sisters, parents and grandparents for everything you have done for me. I am so much what I have learnt from you. Mum and Dad, thank you both for being the solid ground under my feet when the road got rocky. I couldn't have managed without you, thank you for everything.

Thank you so much to the best friends I could ever ask for Gordon, Jeunese, Kirsten, Louise, Laura, Neil, Melanie and Pauline who have all helped me through various challenges. You are all such amazing people and I am honoured to know you.

Craig thank you for your incredible support through the later years of my studies. Thank you for putting up with paperwork all over the house, for allowing me to ignore you when I work late and for encouraging me not to give up and giving me strength to continue. I know we can take on anything together.

Fiona and Bryan - thank you for being so welcoming when I came to London. This was so much easier because of your support. I am indebted to both of you. You are two of the kindest people I have known and an inspiration. I can't imagine how I would have managed without you both. Whether it be hosting Game of Thrones dinner parties or designing educational murder mysteries for data collection you make such a great team and your positive energy affects everyone around you. Thank you for being such a positive influence on both my work and on my life and for generally being awesome.

Thank you to my examiners Dr. Penny Woolnough and Dr. Kevin Allan, for taking the time to read the work presented, for all their insightful advice and for their intellectually stimulating conversation during the Viva Voce process which has been invaluable in my thought process around future work.

Finally, thank you to all who volunteered to take part in the experiments described for your participation.



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## Chapter1: General Introduction

"There's no justice in the world, not unless we make it." Petyr Baelish

This thesis examines an under-researched type of witness memory; that which was unattended at the time of encoding. Encoding is the process by which perceived information becomes held in memory. The term 'unattended' is used throughout this thesis in a manner consistent with the memory literature to refer to items of stimuli out-with attentional instructions (Hoffman and Tzelgov, 2012). In addition, the term 'inattentive witness' is used in reference to those participants, witnesses or persons not attending to target information during encoding which may be of interest in later retrieval attempts. Therefore, the aims of the current thesis are two-fold; a) To examine through experimental investigation the ability of inattentive witnesses to provide information about a perpetrator which is both accurate and forensically relevant and b) to determine whether the quantity and accuracy of recalled information following poor encoding can be improved through the use of different facilitative self-report techniques. Forensic relevance and accuracy are determined by coding schemes implemented by the experimenter based on and adapted from that of Wright and Halliday (2007). To develop an understanding of inattentive witness memory the experiments described manipulate the attentional focus of participants in order to examine their ability to recall attended and unattended information. Several experimental manipulations were aimed at understanding how best to gain information following inattentive encoding and through the use of facilitative techniques.

### Attentive and inattentive witnesses

To clarify the potential differences between the encoding of memories by attentive and inattentive witnesses, take the hypothetical example of a store robbery where a perpetrator enters a store and shouts at the cashier telling them to hand over the money from the till. The customers inside the store noticed the perpetrator because of their attention-grabbing actions and may try to remember details to tell the police afterwards. The customers inside the store who were aware of the perpetrator would be classed in this case as attentive witnesses. This is because during the time of the event they were aware of it occurring, paid attention to it, and intended on remembering it. This intention to remember

is a function known as prospective memory whereby the witness in this case has an awareness and intention to use current memory encoding strategies for future retrieval (Brandimonte, Einstein, and McDaniel, (2014). As the perpetrator leaves the store, they pass a pedestrian on the street before getting into a car. The pedestrian is now also a crucial witness who may be able to provide information about the perpetrator or the car they used despite them not paying deliberate attention at the time. Details supplied by this witness may have an essential impact on the case. In this example, the pedestrian would be classified as an inattentive witness because they were not aware that they had experienced anything of importance and therefore, paid little attention to the perpetrator or the car.

Crimes with non-attending witnesses are highly frequent and are often portrayed in the media with witness appeals being published continuously on police websites and social media sites. News broadcasts and TV shows such as Crimewatch also publicise selected police appeals. After Joanna Yeates was reported missing by her partner, her whereabouts seemed to be a mystery with no leads from family, friends, co-workers or neighbours. Investigating officers decided to release a witness appeal whereby the media were given a description of Joanna as well as CCTV footage of Joanna's last known movements shopping in Tesco's (BBC, 2011). This appeal was explicitly targeted at incidental witnesses who may not remember ever seeing Joanna on the night but know from the appeal that they were in the area at the time. Witnesses of this type are viewed as inattentive as it would be impossible for them to realise the importance of their memories at the time, they encoded them. These witnesses may have held crucial clues to what had happened, such as knowing which direction Joanna walked in after leaving the store, or if she had spoken to anyone.

The Joanna Yeates missing person investigation (later becoming a murder investigation) provides an excellent example of the deliberate targeting of witness appeals towards non-attending witnesses despite psychological research producing little knowledge regarding what investigators can expect to gain from the memories of inattentive witnesses. Many techniques aimed at facilitating memory retrieval have been developed, however these techniques have been researched using participants instructed in a manner lacking the difficulties presented when witnesses are inattentive. Indeed, there is a lack of research on the effects of inattention within the eyewitness literature generally, this is perhaps because of difficulties around the implementation of appropriate experimental design and control. As

a result of the critical role played by witnesses in the Criminal Justice System, the research literature focussed on eyewitness evidence is more extensive than any other area in forensic psychology (Krambia-Kapardis, 2002). Despite this there remains a lack of understanding as to how best to facilitate memory following inattentive encoding.

### Eyewitness memory

Eyewitness evidence is a significant source of information and an essential feature of contemporary and historical police work. The importance of eyewitness evidence is widely acknowledged by both academics and practitioners (Cutler, Penrod and Dexter, 1990; Dando, Wilcock, Milne, and Henry, 2009; Kebbell and Milne, 1998; Köhnken, Milne, Memon, and Bull, 1999; Lieppe, 1980; Visher, 1987). The importance of eyewitnesses is evidenced by the increased probability of a perpetrator being apprehended and prosecuted when witness evidence is available (Lippe, 1980; Visher, 1987). In addition, witness evidence is an essential provider of corroboration adding value to evidence which may have otherwise been viewed as circumstantial. Indeed, in a mock juror experiment, a guilty verdict is more likely to be produced in cases where eyewitness corroboration is available (Duggan, et al, 1989). In court settings, eyewitness testimony is extremely persuasive, affecting decision-making related to both pleas and sentencing as well as being heavily weighted by jurors (Cutler, Penrod and Dexter, 1990; Dando, Wilcock and Milne, 2009a; Kebbel and Milne, 1998).

Unfortunately, episodic recall; memory for episodes of time, and memory for encountered but unfamiliar persons are often flawed, unreliable and vulnerable to both decay and contamination (Fisher, Brewer and Mitchell, 2009; Howe and Knott, 2015; Wells, 2018). Despite the motivations of witnesses, it is often the case that witness recollections are incomplete and inaccurate (Fisher, et al., 2009; Howe and Knott, 2015; Wells, 2018) as retrieval of memory is a reconstructive process that does not provide verbatim report (Anderson, and Bower, 2014; Fisher, Brewer and Mitchell, 2009; Fradella, 2006).

Despite the vulnerabilities of eyewitness memory being well known and well-researched, witness evidence and testimony continue to be a much needed and relied on resource in the criminal justice system. The majority, 70%, of known wrongful convictions in the USA are found to be caused at least in part by witness misidentifications (National Research Council, 2015, cited in Thompson, 2012). Although by comparison to the USA these



issues appear to result in wrongful convictions less frequently in the UK, with less attention on this issue the number miscarriages of justice related to memory for persons remains an ever-present risk for any judicial system and investigators must remain vigilant of potentially erroneous evidence (Poyser and Milne, 2015). Guidelines recommended that decisions regarding those persons included that are known to be innocent (known as fillers) in identification procedures should be based upon resemblance to the person descriptions available from witnesses rather than resemblance to the suspects involved in the identification procedures (National Research Council, 2015, cited in Thompson, 2012). Importantly, this highlights issues around the ability to remember persons with these cases being criticised on the reliability of witness memory specifically related to the appearance of perpetrators rather than the narrative given (National Research Council, 2015; cited in Thompson, 2012: for a review see Howe and Knott, 2015; Wells, 2018).

Familiar faces are shown to be rapidly recognisable from afar, from varied angles and in varied contexts (Bruce and Young, 1986, 1998). However, recognition and identification of encountered but unfamiliar faces are more challenging with less accurate outcomes (Hancock, Bruce and Burton, 2000). Person descriptions by their nature tend to be required for unfamiliar people as those familiar to witnesses may be identified by other known details such as name, residence, place of work etc.

Psychologists examining the perception and recognition of faces agree that this process cannot be explained by the same mechanisms as is employed to understand object recognition (Farah, 2004; McKone, 2004). According to all significant theoretical viewpoints, humans recognise objects through a complex process combining the perception of stimuli and previously held knowledge. The features of a stimulus such as shape, colour and size determine the difficulty level involved in the recognition process (Selfridge and Neisser, 1960; Hayworth and Bierderman, 2006; Kayaert, Biederman and Vogels, 2003). The recognition of faces on this basis is somewhat challenging as features, for the most part, differ less than those of objects. The evidence for such claims is wide and varied. For example, Bruce, Green and Georgeson (2003) found that babies show higher levels of visual tracking when shown photographs of faces in comparison to other objects (Johnson, 2001). In addition, recognition is seen to be more accurate when the whole face is perceived. The ability to recognise a face is significantly better than for objects when some features are obscured (Tanaka and Farah,

1993; Tanaka, Kiefer, and Bukach, 2004). This suggests that faces are processed in a more holistic manner than objects.

In addition, neurological evidence suggests that external features can be processed in a similar manner to objects taking account of hair colour shape and length but can also be processed holistically within a representation of the face as a whole (Kamps, Morris and Dilks, 2019) as well as being processed on a featural basis. Internal features differ less in shape, size, colour or any other distinguishing feature making featural processing more difficult. It is for this reason that internal features of faces generally undergo only holistic processing during encoding (Kamps, et al., 2019). During retrieval, be it by recall or recognition, internal features are more difficult to focus on independently of the face and are difficult to describe verbally. This explains the tendency of witnesses to report external features such as hairstyle while having difficulty recalling internal features such as the nose and mouth. This poses an additional risk to memory accuracy as demonstrated by Verbal Overshadowing.

Verbal Overshadowing is a known effect in which the process of verbally describing a face can impair the ability to accurately recognise the face (Dodson, Johnson, and Schooler, 1997). This is thought to be due in part to the language constraints involved in retrieval determining that featural processing must be engaged in while identification procedures, based on recognition memory relies upon holistic processing (Dodson, et al., 1997). Thus, the featural processing of the stimuli prior to holistic processing is thought to be disruptive to accurate recognition. The effects of Verbal Overshadowing are temporary and thought to last around two days (Schooler and Engstler-Schooler, 1990). While not long lasting, waiting the appropriate time for these effects to dissipate may allow for decay in memory (Schooler and Engstler-Schooler, 1990). Indeed, Barkowitz, and Brigham (1982) found the effect of delay to impair recognition and to alter the threshold of their response with an increased likelihood of incorrect identifications and own race bias effects. The findings discussed above alongside the issues of witness reliability in the area of memory for persons shows the importance and potential impact of earlier recall attempts on the processes to follow (Dodson et al., 1997). With memory quality deteriorating over delays it is also crucial that information is collected efficiently during the initial, time-sensitive stages of an investigation with witnesses often providing crucial leads and highlighting other potential sources of information at this stage,

be that physical evidence or further witness evidence (Bromby and Hall, 2002; Coupe and Griffiths, 1996; Kebbell and Milne, 1998).

Recall ability has been robustly shown to decrease following delay (Ebbinghaus, 1885; German language paper cited in Kassin, Tubb, Hosch, and Memon, 2001; Rubin and Wenzel, 1996; see also Tuckey and Brewer, 2003a, 2003b). Delay is yet another disadvantage that must be faced by inattentive witnesses particularly if lack of awareness has led to lack of engagement with investigators as then they may incur additional delays in comparison to attentive witnesses. For example, it may be that an inattentive witness comes forward following a witness appeal or that other key witnesses (likely attentive) are prioritised ahead of inattentive witnesses in the scheduling of interviews or identification procedures.

The level of specificity of details recalled by eyewitnesses is known as the grain size (Goldsmith, Koriat, and Pansky, 2005; Goldsmith, Koriat, and Weinberg-Eliezer, 2002). Information is considered coarse grain if it is general or approximate in its level of detail. Fine grain information is more specific and detailed. For example, if asked what time something occurred at, a witness may give a coarse grain answer such as 'the afternoon' or they may provide a more specific fine grain answer such as '3.30pm.' In addition, fine grain information, that which is detailed and specific in nature (e.g. the make, model and registration of a car) have been robustly found to decay more rapidly than coarse grain information; less detailed information providing larger more general descriptors (e.g. a black saloon style car) (Koriat, Levy-Sadot, Edry, and de Marcas, 2003). The same pattern is also evident in memory for verbatim information being lost more rapidly than gist information (Kintsch, Welsch, Schmalhofer, and Zimmy, 1990). To date, there is no research directly examining the effect of inattentional encoding on fine and coarse grain recall within a witness scenario.

Just as delay and other factors affecting the encoding experience can impact upon retrieval so can post-event experiences (Lindsay, and Johnson, 1989b; Loftus, Miller, and Burns, 1978). Delay allows for not only forgetting to occur but provides additional opportunity for memory contamination to occur (Flin, Boon, Knox, and Bull, 1992). A wide range of memory errors due to factors influencing the witness following exposure to the to be 'remembered' stimuli have been observed. For example, witnesses may be susceptible to suggestion in which information accurate or otherwise (mis-information; Loftus, Miller, and Burns, 1978), encountered after the encoding experience (post-event information) may be

incorporated into memorial representations and reports (Lindsay, and Johnson, 1989a). In addition, exposure to (mis)information suggested prior to the encoding experience can impact upon the representation of events in memory and their subsequent report in what is known as the reverse suggestibility effect (Lindsay and Johnstone, 1889a). In addition, witnesses may also confuse the source of information believing it to be recalled from the original encoding experience when in fact it has been encountered elsewhere (Johnson, Hashtroudi, and Lindsay, 1993; Mitchell and Johnson, 2009). This is of particular concern given the known memory conformity in which discussion can cause witnesses to both adopt information encountered into their own memorial representations and adapt confidence judgements (Goodwin, Kukucka, and Hawks, 2013; Gabbert, Memon, and Allan, 2003). In addition, individual traits such as social anxiety is shown to affect susceptibility to suggestion via discussion and memory conformity with mock witnesses' avoidant of negative social feedback being more likely to accept suggested information and conform to another's memory report while those that are avoidant of social situations are more likely to resist conforming to other suggestions (Wright, London, and Waechter, 2010). With memory contamination being a potential risk having a 'good recall opportunity' given early may inoculate against this as was found by Gabbert, Hope and Fisher, (2009).

To remember episodically, an individual must perceive, and encode information, hold the details in memory and then be able to retrieve and consciously report this later. The quality and quantity of information reported by eyewitnesses during memory retrieval in part depends on the processes preceding it at encoding, beginning with perception.

The perception of information, despite being performed seemingly effortlessly, involves numerous complex processes, undertaken to help make sense of the environment and to allow appropriate responses. In an eyewitness scenario, visual details are likely to be the primary sources of information regarding person descriptions that are later recalled (although others such as auditory, olfactory and tactile details may also be provided). Visual information from the external environment is received through light entering the eye, being focussed onto the visual receptors of the retina then transduced into action potentials (Goldstein, 2014). The electrochemical pattern of action potentials allows for further neural processing to occur. This allows for environmental stimuli to be perceived and recognised, and for responsive actions to be taken (Goldstein, 2014). Memory and perceptual processes

are integrated both working in conjunction, providing a top-down knowledge base on which to conceptualise incoming information, thereby aiding understanding of the environment (See; Breedlove and Watson, 2013, Eagleman 2015). It is the area of integration between perception and memory that the focus of this thesis now turns. Many models and theoretical perspectives related to both memory and attention posit that recall ability is dependent primarily upon the attention paid during encoding with various factors found to cause impaired encoding; for example, intoxication (Bayless, Harvey, Kneller and Frowd, 2018) or high stress (Hoscheidt, LaBar, Ryan, Jacobs and Nadel, 2014) however, very little is known of the impact of inattention within eyewitness scenarios. To explore the memories of inattentive witnesses, the current work must draw upon research related to both attention and memory. The current thesis begins by reviewing relevant models and theoretical viewpoints before discussing the potential implications for eyewitnesses and investigators.

### (In) Attention Models, Theories and Findings

The critical relevance of attention to eyewitness testimony is its influence on encoding processes, allowing some stimuli to be encoded more effectively than others (Srull, and Wyer, 1980). Within a live environment (including an eyewitness situation) people face an overwhelming influx of information, with an excess of sensory input in various modalities. Attentional processes prioritise incoming information from complex stimuli to deal with it in a meaningful way (Mulchuyse and Theewes, 2010; Tanaka and Shimojo, 1996; Theewes, 2010; Vullemier, 2005).

An interesting distinction can be drawn between explicit attention (conscious focus of attention) and implicit attention (out with conscious focus). Information reported following inattention can be viewed as not having obtained explicit attentional capture or without attentional focus (Simons, 2000a). There is disagreement within the literature as to whether implicit processing is possible and what the fate of information which is not explicitly attended to might be (Jensen, Bonnefond and Van Rullen, 2012; Itti, Koch and Neibur, 2000). This debate mainly exists between advocates for single and dual route models of attention.

Classic single process models such as Broadbent's Filter (1958) Model and Treisman's (1964a, 1964b) Attenuation Model argue that attention is a prerequisite to any memory storage beyond the very short capacity of sensory storage. Therefore, any retrievable

information from short or long-term storage must first receive attentional processing be it implicit or explicit, with the latter being required according to single route models (Haber and Haber, 2000; Jensen et al., 2012; Schmidt and Dark, 1998). This suggests that for the most part information not selected for attention during the filter process is simply lost from sensory memory (Haber and Haber, 2000; Jensen et al., 2012; Schmidt and Dark, 1998). Haber and Haber (2000) advocate the opinion that there is no known cognitive mechanism for the processing of unattended information in a passive manner (i.e. without explicit attention) .

However, even single route models seem to acknowledge that attentional switching may occur providing a mechanism for unattended stimuli to capture attention if the information is salient or of personal importance (Cherry, 1953; Haber and Haber, 2000; Koch, 2004). Treisman's Attenuation Model (1964a; 1964b) with a further modification accounting for semantic processing of unattended information explains how information may come to be encoded through attentional switching. According to this model if the features of the stimuli are beyond a threshold level of semantic salience, importance or of personal relevance then information is set on a path for further processing. Treisman's proposal that the semantic meaning is processed as determining factor in the allocation of attention is supported by the findings of flanker tasks and dichotic listening tasks (Paquet and Lortie, 1990). These experiments find participants, respond to stimuli in the unattended information streams if it is deemed semantically relevant for example, their name. Thus, if a threshold is reached then a switch in attentional focus is induced (Moray, 1959).

Various models including Treisman's Model (1964a, 1964b) suggest that automatic processing filters are responsible for these attentional switches (Cowan, 1988; Hoffman, 1979; Jonides, 1981; Logan, 1988, 1992; Neumann, 1984; Posner, Snyder and Solso, 2004; Shiffrin and Schneider, 1977; Treisman and Gelade, 1980; Schmidt and Dark 1998). However, If this were to be generalised to all memory, it would suggest that information is only retrievable (beyond the capacity of sensory memory) if attention has been focussed on it either initially or due to an attentional switch. This would mean that inattentive witnesses would produce no relevant information about unattended scenes.

Early research endorses the view that attentional switching is necessary for unattended information to become attended and therefore retrievable, for example, in Cherry's dichotic listening task, that attention could be reoriented based on semantic saliency

of the audio input (1953). This was reasoned to be due to bottom-up detection of personal importance through non-attentional automatic processing. If such theories are correct, then it may be that this information is retrievable using facilitation techniques, which increase retrieval support. Similar findings can be seen in the flanker task, a visual equivalent to the dichotic listening task. To succeed in the flanker task participants must respond to centrally presented information while ignoring distractors presented either side of the target. Eriksen and Eriksen (1974) found that response times increased in the presence of flankers within a visual angle of one degree of the target. The response time was also found to increase further when non-similar flankers were used rather than those identical to the target. The flanker effect has been studied and manipulated repeatedly with the following factors being found to have either a facilitative or inhibitory effect on response time; size, colour, distance between target and flankers, motion and semantic categorical overlap (Miller, 1991; Harms and Bundesen, 1983; Eriksen and Eriksen, 1974; Driver and Baylis, 1989; Paquet and Lortie, 1990). These findings show that 'unattended' information streams are being processed for basic features providing a mechanism for bringing attention to stimuli deemed highly important or relevant to the individual.

It can be argued that this modification to Treisman's model compromises its single route nature by providing a secondary pathway to attention; however, it remains a requirement of the attenuator model that for information to be retrievable explicit attention must be paid during encoding. Those advocating for a dual route model of attention suggest that a) explicit attention may not be necessary for information to be passed into short term memory and b) that to draw attention; inducing a switch to explicit attention in the manner observed in dichotic listening and flanker tasks would require some level of implicit processing to have occurred out-with attentional focus (Posner, Snyder and Davidson, 1980).

The dual-process perspective, therefore, argues that stimuli receive a level of automatic implicit attentional processing which selects information for further processing or attrition. Late selection dual-route models presented by Deutsch and Deutsch (1963) and Norman (1968) propose a secondary selection process which allocates explicit attention after the information has already passed through short term memory via implicit attention. In this way, information can make it into short-term memory prior to or indeed without, explicit attention. This may provide a means by which unattended information may be encoded into

memory and held at least in the short-term. Which according to memory models discussed later provides a route to long-term memory (Baddeley, 2000). It follows that inattentive witnesses may be able to retrieve relevant information even without deliberate attention being paid if both dual-route models are an accurate representation of the workings of implicit attention and memory for unattended information.

This fits with the idea asserted by other researchers that all information to be encoded into memory is first attended to and processed to a degree implicitly. For example, Jensen et al. (2012) suggest that before gaining attention, information is processed through a saliency-based bottom-up system. Their findings suggest that we pick up on attention lures and conduct judgements of information relevance, prioritising them for attention allocation in future perceptual cycles (Jensen et al., 2012, Itti, Koch and Neibur, 1998). Through this system, even information not explicitly attended to receives implicit attention and processing and can enter short term memory if it is judged to be relevant enough.

Similarly, Itti, Kock and Niebur (1998) and Itti and Koch (2000) presented a model of attention based primarily on the neural design of the visual system with a computational perspective. The model suggests that locations in the visual scene are selected for attention in a prioritised order according to saliency. The purpose of the selection process from this perspective using attention is to reduce the complexity of incoming information (Itti et al., 1998). The model recognises that attentional resources can be directed in both a top-down task-dependent manner and in a bottom-up stimuli dependent manner with the latter being a faster process (Tsotsos, et al., 1995; Tsotsos, 1995; Itti et al., 1998).

Within the laboratory, implicit (pre-attentive processing, according to the single route perspective) and attentive processing can be examined using visual search tasks. These tasks typically require participants to locate a target item among many distractor items. Findings consistently show, in cases where distractor items are low in similarity to the target item, then the target can be identified quickly with little effort (Hershner and Hochstein, 2005; Wang, Cavanagh and Green, 1994). This phenomenon is known as the 'pop out' effect and describes an almost immediate and automatic target identification without attention when targets are dissimilar to surroundings. This effect is present regardless of the number of distractors (Wolfe, 1998a, 1998b; Wang et al., 1994). This suggests that when distractor item properties differ from those of the target a parallel search of stimuli is conducted simultaneously without



allocating attention to the task itself (Wolfe, 1998a, 1998b; Wang et al., 1994). In addition, Wang et al. (1994) show that unfamiliar targets among familiar surroundings pop out more so than familiar targets within unfamiliar surroundings. This implies that attentional switching is in part dependent upon top-down knowledge-based expectations and demonstrates the processing of information peripheral to attentional focus.

It appears evident from the findings above that information can be selected and prioritised for processing through a variety of means (Mulclhuyse and Theewes, 2010; Tanaka and Shimojo, 1996; Theewes, 2010; Vullemier, 2005). In addition, it appears mechanisms for implicit attention are observed; and that information can pass into memory without explicit attention. It remains unclear whether unattended episodic memories are retrievable and reliable in circumstances representative of eyewitness experience. For eyewitnesses, this may mean differences in attentional allocation and recall exist depending on various factors such as saliency, expectation or familiarity which may dictate attentional focus and ability to recall.

In the hypothetical store robbery discussed earlier, it could then be argued that the attentive witness inside the store would make use of bottom-up processing due to the high salience of the scene. In contrast, the witness on the street would be more likely to use the slower method of attention allocation, top-down processing with focus being directed towards stimuli related to the witnesses' current goals rather than that of interest to investigators. If the information is not deemed of personal importance, salient, novel or of interest in some other way to them the witness on the street, in this case, would be unlikely to allocate explicit attention to the perpetrator as information more relevant to the witness' current task would be prioritised. The single process theories suggest that with no attentional switch the witness would not be able to retrieve useful information while the dual route perspective suggests that even without attentional switching, information may remain retrievable. Therefore, if the single route model is correct then inattentive witnesses should be unable to produce sufficient information to warrant efforts made obtaining it as unattended information could not be recalled. On the other hand, if dual-route models are correct then inattentive witnesses may have access to valuable information. It may also be the case that inattentive witnesses are able to provide different details to attentive witnesses due to different attentional focus at the time.

### (In) Attentional focus and the capture of attention

In selective attention, choice is not always involved; stimuli can grab attention and induce 'forced awareness' (Friedenberg, 2013). In contrast instances of 'forced seeing' where no conscious awareness or attention is paid to the stimuli is reported while behavioural reactions indicate a level of processing (Friedenberg, 2013). In this way, stimuli may be 'seen without looking' or rather stimuli may be processed implicitly without reaching the thresholds inducing explicit attention. In instances of 'looking without seeing', perceptual and cognitive resources may allow for some processing of input without conscious awareness (Friedenberg, 2013). Koch (2004) reports automatic eye movements towards target stimuli through sensory-motor attention, finding that people can visually attend and respond to information they are not aware of. When participants are asked to fix their gaze upon a central light in a dark room, they continue to automatically move their gaze towards a peripheral light when it appears, without awareness of doing so (i.e. 'forced seeing', E.g. Koch, 2004).

Movement of visual focus from one point to another is known as saccades. Saccades generally occur without awareness due to saccadic suppression; the process which maintains visual continuity and prevents the perception of 'jumps' in vision. During the first saccade towards the target of which participants are unaware the target light had moved a second time (Koch, 2004). Participants would re-adjust the location of their next visual fixation point despite being unaware of the move. Koch (2004) calls these controllers of eye movements 'visual Zombies' due to the involuntary role played in re-locating visual fixations to the correct target locations. This example shows, from a visual perspective processing of stimuli without explicit awareness or attention and thus presents the primary argument for the inattentive encoding of information into memory being possible.

In the previous example, the change in the direction of light was processed without consciousness as the participant was not able to report the direction change despite perceiving it (Koch, 2004). Similar effects can be seen in visual search tasks for example, if we were to look for a friend in a crowded train station, we pay attention to all faces in our view and are aware of them. This is an example of a visual search, we are looking at the entire scene and taking in the visual information but are not immediately aware or conscious of the target information, in this case, our friend, being present within that scene (Bruce, 2017) Indeed, Memory for faces through recognition or recall without familiarity or significant

exposure be it through frequency or saliency is known to be difficult (Ellis, Shepherd, and Davies, 1979; Bruce, 2017). We may not spot our friend immediately, but familiar faces are highly salient, with an ability to grab attention.

Indeed, highly familiar faces are known to have similar effects with faster reaction times and different event-related potential (ERPs) patterns observed for familiar faces than unfamiliar faces (Schweinberger, Pickering, Jentzsch, Burton, and Kaufmann, 2002). Familiar brand logos have also been found to have a similar ability to draw attention as familiar faces (Qin, Koutstaal, and Engel, 2014). It is suggested that this may be due to the recognition of faces and familiar logos occurs holistically while the processing of most objects occurs on a featural basis. In contrast, a novel or unusual stimulus can grab attention in what is known as the novelty/oddball response (Linden et al., 1999). This effect suggests that unusual information during object recognition is likely to cause attentional switching towards the novel object (Linden et al., 1999).

In addition, Stimuli presented centrally are most likely to be attended to (Posner, 1980; Posner and Peterson, 1990). Indeed, Rensink, O'Regan, and Clark, (1997) found that changes in the visual environment are noticed easier when visual focus is directed towards objects of interest than when these are presented in areas peripheral to visual focus, however, change blindness; the inability to notice obvious changes due to disruption in encoding (discussed below) can occur within areas of central focus too. Information present in the periphery can also be perceived and attended to simultaneously (Van Voorhis and Hillyard, 1977; Posner, Snyder and Davidson, 1980). Haber and Haber (2000) show that information in a direct view (foveal focus) can be overlooked if implicit attention is actively engaged in peripheral areas of vision or by internal thoughts. Supporting this, luminescence detection paradigms find that attentional shift costs (duration of saccades) are comparable, regardless of whether presented in central or peripheral regions of vision (Posner et al., 1980). It is therefore suggested that central and peripheral information is being processed simultaneously as the lack of difference in response time shows no requirement for an attentional switch before the switch in visual focus (Posner et al., 1980). This suggests that processing of stimuli occurs prior to focus of attention being directed and that the ability to use implicit attention without awareness may be due to a diffusion of attention screening the entire environment in a spatial manner regardless of explicit visual or cognitive attentional

focus. Two phenomena which highlight the potential for information of importance to go unnoticed are change blindness and inattention blindness. Inattention blindness is an inability to detect target stimuli in the environment which should cause attentional capture either through salience, familiarity novelty or relevance. Change blindness is the inability to perceive what should be easily identified and obvious change in the environment. Typical change blindness studies find that changes in the immediate visual field are not recalled or responded to. Simons and Levin (1998) demonstrate change blindness in a live environment in which half of participants failed to notice the person they were conversing with changing when visual engagement is temporarily disrupted. In this case a door passing between the participant and the confederate, allowing the confederate engaged in the initial conversation to switch places with a secondary confederate. Inattention blindness is a similar effect in which observers fail to notice information which should be salient and easily noticed but is unchanging.

The Inattention blindness and change blindness effects are thought to be based on similar mechanisms. In both phenomena pertinent information is typically unattended until an attentional switch occurs, thereafter, the stimuli previously unnoticed is difficult to ignore and 'forced seeing' of the stimuli directs attentional focus towards it (Simons, and Chabris, 1999). In typical blindness studies (inattentional and change) efforts are made to disrupt encoding making the task more cognitively difficult. For example, in the flicker paradigm, inattentional blindness and change blindness is more difficult to detect because the image of interest is not static and stable.

Inattentional blindness in a live setting without visual disruption was observed by Vendetti, Castel and Holyoak (2013) who tested participants memories for an elevator panel. It was found that despite participants having regular opportunities to view and interact with the panel during their everyday lives they were unable to provide accurate details about the layout. Both experiments discussed here (Simons, and Chabris, 1999; Vendetti, et al., 2013) show blindness not only to information which the participant is exposed to but which they have also interacted with. Similarly, Nickerson and Adams (1979) also show that memories for objects frequently interacted with are flawed. Nickerson and Adams (1979) asked participants to identify the correct image of a coin from a selection of coin images with similar

features. It was found that even commonplace items such as coins were difficult to identify accurately.

These findings challenge the idea that attentional focus is the main prerequisite to memory as in both cases some level of attentional focus is required for interactions with stimuli (confederate or elevator panel) to take place. One possible function of inattentional and change blindness is the idea that with a constant influx of information both implicit space-based attention and explicit focussed attention may filter out that which is deemed irrelevant or not to be a priority for rehearsal and storage in memory. This would require access to top-down knowledge in order to identify what information is relevant or important and should receive further processing. The WMM (Baddeley, 2000) discussed later provides a potential route for integration of incoming information from both sensory and long-term memory within short term memory thereby providing a route by which implicit attention may result in retrievable memories.

Simons (2000) suggests that implicit attention is space-based and may be responsible for noticing salient or unexpected information resulting in attentional switching. Simons (2000) suggests that while unexpected but not necessarily salient information is highly likely to cause an attentional switch, this is not the case for salient information which is expected or does not seem out of place. On the other hand, Inattentional blindness studies also show that unexpected items in the visual scene can be difficult to detect where other distractions are present during encoding, for example, the appearance of a Gorilla during a basketball game (Simons and Chabris, 1999). It is suggested that inattentional blindness may be due to implicit attention screening out information deemed irrelevant to the current goal despite being salient (Simons, 2000).

In opposition to blindness effects, the oddball effect (Linden et al., 1999); whereby unfamiliar objects draw attention is quite the opposite to the benefits of familiarity seen in the recognition of faces (Ellis, Shepherd, and Davies, 1979; Bruce, 2017). Visual focus is seen to increase the likelihood that change in the environment is noticed (Rensink, et al, 1997), suggesting explicit visual focus leads to additional attentional focus (Posner, 1980; Posner and Peterson, 1990). However, peripheral information can be attended simultaneously (Van Voorhis and Hillyard, 1977; Posner et al. 1980). Thus, it appears there is a case for a dual-route perspective of attention and memory whereby, information is integrated across

memory stores allowing for top-down knowledge to influence the application of attentional resources. With this in mind, the literature review now turns to the factors impacting upon the capture of attention and the relationship between attentional capture and memory.

An example of forced seeing that is particularly relevant to eyewitness memory is the 'weapon focus' effect, which exemplifies the potential for memory retrieval to be impaired by the directing of attention towards a weapon (Kassin, et al., 2001). The phenomenon of weapon focus may suggest recall is impaired with narrowed attention; thus, it may be that inattentive witnesses can provide information not retrievable by attentive witnesses who have narrowed their focus onto target information. In weapon focus studies participants are often able to report much more information about the weapon than the perpetrator using it (Kassin, et al., 2001).

The weapon focus effect provides an example of how episodic memory can be affected negatively by the narrowing of attention to focus on one location at the time of encoding. The weapon focus effect is the robust finding that the presence of a weapon negatively impacts memory of witnesses (Johnson and Scott, 1976; Kassin, et al, 2001). In a meta-analytic review, a significant and reliable difference across 19 studies was displayed in which participants who viewed a weapon-absent stimuli scene performed better on line-up identification tasks than participants viewing weapon-present stimuli (Steblay, 1992). This effect has also been shown regarding memory for the event itself including scene description (Hope and Wright, 2007). Loftus, Loftus and Messo (1987) demonstrated the effects of weapon focus on both attention and memory have been observed using eye-tracking technology which examines the location of explicit visual focus. It was found that participants who viewed a weapon present video spent more time with visual focus fixated on the weapon than those viewing a weapon-absent spent looking at a control item. In addition, participants in the weapon present condition performed less well on memory tasks and displaying the classic weapon focus effect. This study shows that the presence of a weapon captures visual focus and attention to the exclusion of other information. It is suggested that the attentional draw observed in weapon focus is similar to the novelty/oddball effect (discussed above) as this is an unusual stimulus for most individuals however there may also be influences of eyewitnesses' emotions at the time particularly if they feel under threat (Fawcett, Russell, Peace, and Christie, 2013).

A compelling explanation for the weapon focus effect is the influence of emotion on attention capture (Christianson, Loftus, Hoffman and Loftus, 1991; Sarwar, 2011; Righart and De Gelder, 2007; Koji and Fernandes, 2010). The Easterbrook hypothesis (1959) suggests that arousing stimuli can cause peripheral information to be disregarded in favour of attentional focus being heightened around central vision. This increases the processing of the arousing stimuli but overlooks potentially important information surrounding it. The central focus of the encoding environment was shown to influence the processing of faces negatively through top-down attentional control in both working memory tasks (Landau, Schumacher, Garavan, Drugzal, and D'Esposito, 2004; Koji and Fernandes, 2010) and visual imagery tasks (Mechelli, Price, Friston and Ishai, 2004; Koji and Fernandes, 2010). For example, attending witnesses, those aware of the 'to be remembered' nature of the stimuli may be more able to report details about the perpetrator. Conversely, those unaware of the relevance may be more able to provide information about the entirety of the stimuli but less about the perpetrator at the centre of the event. This fits with the idea presented in the Easterbrook hypothesis if emotion is used as a proxy for arousal.

Emotion and arousal although related are not interchangeable. Stimuli may be arousing of attention while being emotionally neutral. However, there are some contradictory findings regarding the effects of arousal on memory; Heuer and Reisberg (1990) found that arousal promoted memory for peripheral details as well as central (Hulse et al., 2007, Sarwar, 2011) while Wessel and Merckelbach (1997) found no improvements due to arousal. The weapon focus effect demonstrates that stimuli in the external environment associated with threat can very effectively capture attention, influencing encoding. Similarly, if inattentive witnesses have attention focussed elsewhere, then, theoretically the effects on information recalled may be similarly impaired. However, as in previous research, it may be that the lack of emotional arousal in inattentive witnesses, benefits memory (Landau, et al., 2004; Koji and Fernandes, 2010).

In contrast Houston, Clifford, Phillips and Memon (2012) found negative emotion to result in improved recall when participants were exposed to either a scene depicting a mock crime (Mugging/bag theft) or to a scene depicting the same people having a conversation. The two videos were used in order to manipulate the emotions of participants with the mock crime being aiming to induce negative emotion. Participants memories for this scene were

then compared to participants' memories for the neutral emotion scene depicting a conversation. It was found that those in the negative emotion condition recalled more information than those who viewed the neutral scene, but no difference in accuracy was observed. It could be argued that rather than manipulating emotion the difference in these two scenes was the performance of attention-grabbing actions in the negative emotion condition while the neutral condition did not have the effect of drawing attentional focus in the same way as the actions performed may be viewed as lacking in importance by comparison. Supporting this is the finding that participants in the negative emotion were relatively low in comparison to the ratings available to participants; however, a significant difference in emotional ratings between groups was observed. It is suggested therefore that the emotional context of the video and the differences in attention paid may have an interactive effect. This limitation is taken into consideration in the current thesis by ensuring participants in the attentive and inattentive conditions are exposed to the same stimuli materials with the manipulation of attention being manipulated without altering the stimuli experienced.

From the findings presented it seems evident to conclude that attentional focus does not necessarily lead to information being encoded (Vendetti, et al., 2013), however, it also seems evident that some implicit processing must contribute to the various effects discussed in which stimuli is able to draw attention (familiarity; Schweinberger, Pickering, Burton, and Kaufmann, 2002; novelty; Linden et al., 1999; Weapon focus; Eble, 1980; Loftus, and Monahan, 1980; Sarwar, 2011; Righart and De Gelder, 2007). The evidence suggests that it is possible to both prioritise selective attention directing attentional focus or to divide attention between multiple input sources while implicit attention is continuously distributed in a spaced-based manner until the threshold for attentional focus is attributed to a location inducing an attentional switch (Koch, 2004). Thus, attentional processes can be seen to impact in various ways upon memory. To examine this further the next section discusses memory models for consideration.

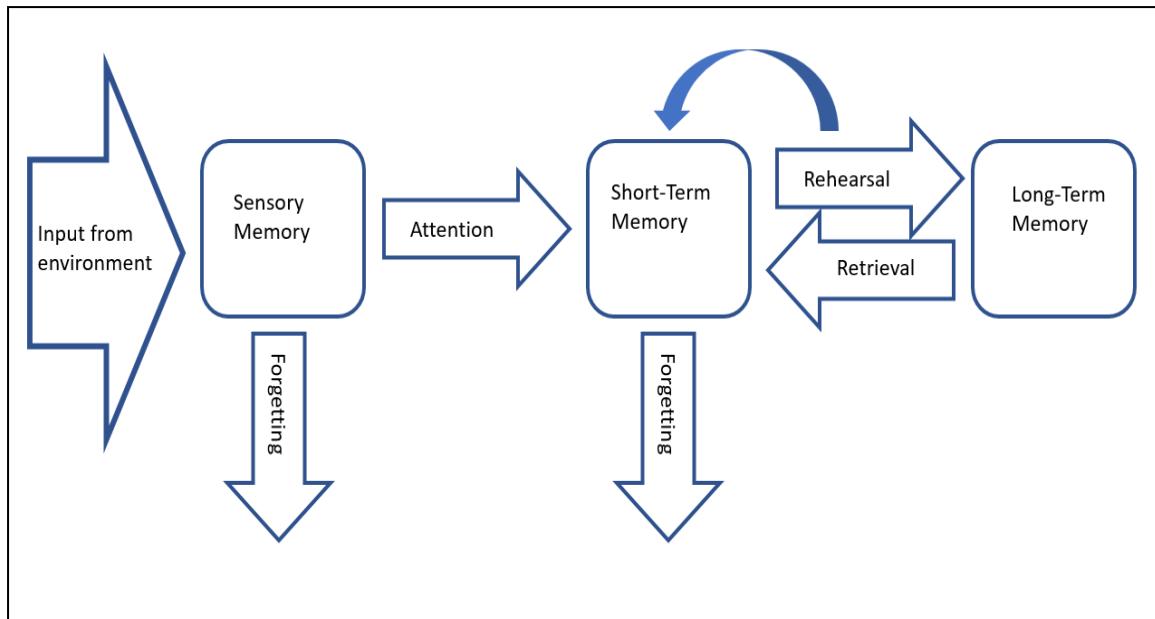
### Memory representations and models

Within the memory research literature, an early and enduring distinction between short term and long-term memory was reached (Atkinson and Shiffrin, 1968; Murdock, 1974, 1982). In addition, researchers agree that there is evidence for a temporary memory system



with a larger capacity and storage duration than iconic/sensory memory, while having lesser storage duration capabilities than long-term memory (Kikuchi, 1987; Locke, 1960; Purdy and Olmstead, 1984; Sperling, 1960; Waugh and Norman, 1965; Reisberg and Logie, 1993). Models in agreement with this structure include Atkinson and Shiffrin's (1968) Multistore Memory Model and Baddeley's Working Memory Model (Baddeley, 2000). This also fits well with attention models and related findings discussed above such as Broadbent's early selection Filter Model (1958), Treisman's (1964a; 1964b) early selection Attenuator Model, and late selection models of attention presented by Deutsch and Deutsch (1963) and Norman (1968) as well as models with movable attention filters such as that presented by Posner and Snyder (1975).

Atkinson and Shiffrin's Multistore Model of Memory (1968) suggests that environmental input enters sensory memory and is either attended to and passed onto short term memory or lost. The remaining attended information may then follow one of three routes 1) it may be forgotten after entering the short-term store, 2) it may pass directly into Long-Term Memory or 3) it may be rehearsed in Short-Term Memory further before passing into Long-term memory. This implies that information not explicitly attended cannot be present in short term memory or transferred into long term memory (Murdock, 1974). For inattentive witnesses this would suggest that target information about experiences which were unattended are not retrievable in later recall attempts. If correct then the Multistore Memory Model (Atkinson and Shiffrin, 1968) suggests that appealing for inattentive witnesses is not an efficient use of resources, funds and efforts as information not only receiving implicit processing is lost and irretrievable at a later time. The Multistore Model of Memory further suggests that the amount of sensory input and attentional resources available determines what information is transferred into short-term memory but does not describe how selections may be made.



*Figure 1: The Modal/Multi-store Model of Memory (Atkinson and Shiffrin, 1968).*

Initial support for the distinction between temporary and longer-term stores comes from word list experiments. In such experiments, participants are asked to retrieve lists of previously learnt words. Typically, participants are better able to retrieve the words listed first (primacy effect) and last (recency effect) in comparison to words presented in the middle of the list, during immediate tests. These results suggest the Multistore Memory Model provides a good representation of memory in that rehearsal seems to be important in the ability to later retrieve information from long-term memory and explains the lack of recall for mid-list words as being due to interference from the other words being presented in quick succession overloading attentional resources preventing access of mid-list words to the short-term store. (Capitani, Della Sala, Logie, and Spinnler, 1992; Glanzer, and Cunitz, 1966; Nipher, 1876; Reisberg and Logie, 1993). This supports the structure and functions predicted by the Multistore Memory Model and suggests that explicit attention is required for the encoding of stimuli into long-term memory. The Multistore Memory Model, and the WMM agree that some form of short-term memory is a necessary prerequisite to Long term memory and that information within short term memory can be rehearsed, suggesting that processing is taking place rather than just storage. However there is disagreement on whether implicitly processed information can be transferred into long-term memory via implicit rehearsal. However, the WMM (Baddelley et al., 1986; Baddelley, 2003; Baddeley and Hitch, 1974) details the process of memory rehearsal more specifically providing a potential route for

unattended information to be firstly encoded into short term-memory and secondly implicitly processed in working memory.

The ability to rehearse information is considered fundamental to the structure and function of Baddeley's WMM. This idea is further supported by the difference in performance regarding the last listed words when an unrelated filler task has been performed directly following list presentation. Participants given an immediate filler task do not show any increased retrieval ability for words presented last than words presented mid-list (Logie, 1995), because the disruption caused by the filler task prevented rehearsal of the final words. This shows an issue left unexplained by the Multistore Memory Model is the contribution of rehearsal. This is evidenced further in data of amnesic patients with brain damage aetiologies and long-term memory impairment being able to complete tasks requiring access to information beyond the time limitations of sensory/iconic memory (Warrington and Shallice 1972). Baddeley's WMM explains these findings with less difficulty than The Short-Term Memory Model as the ability to rehearse information is considered fundamental to the structure and function of the model.

Baddeley suggests that disruption caused by the filler task prevented rehearsal of the final words and that ability to rehearse must, therefore, play an important role in the transfer of information from short term memory into long-term memory stores. Baddeley (1974), Introduced the WMM containing multiple components to explain the process of rehearsal further. The WMM suggests that processing is taking place rather than just storage within short-term memory. This is evidenced in data of amnesic patients with brain damage aetiologies and long-term memory impairment being able to complete tasks requiring access to information beyond the time limitations of sensory/iconic memory (Warrington and Shallice 1972).

The Multistore memory model suggests rehearsal is a singular explicit process while Baddeley's WMM suggests a structure of multiple components allowing for differentiation in how information of different types is processed. Baddeley's original model contained three components; the Phonological Loop, the Visuo-Spatial Sketch Pad and the Central Executive. The Phonological Loop processes and rehearses auditory information such as speech while the Visuo-Spatial Sketch Pad processes and rehearses visual and spatial information. These

sub-systems are overseen by the Central Executive which prioritises and allocates resources. In this way, the Central Executive holds control over the sub-systems (Baddeley, 2001).

Sub-systems of The WMM; the Phonological Loop and visuo-spatial sketch-pad are proposed to have a limited processing capacity. This suggests that each component may become overwhelmed if the limits are reached. This has been tested using dual-task paradigms, under the assumption that performance will be impaired on tasks when they are of the same modality, therefore requiring processing by the same component when compared to task performance on dual tasks of different modalities. If the WMM is correct, then more memory impairment on dual-tasks should be observed in same-modality tasks compared to cross-modality while the multistore model would predict impairment to be similar regardless of modality. Several researchers have found retrieval of information from same modality dual-task processing to be the more challenging (Baddelley and Andrade, 2000; and Baddeley and Wilson, 2002; Quinn and McConnell, 1996a, 1996b). This suggests that a) distinct components provide rehearsal for information of distinct modalities, b) each component may become overwhelmed if the limits of its capacity are being reached and c) there is some potential to affect other processes, supporting a Central Executive function. This supports the concept of separate but integrated systems within working memory and therefore Baddeley's model appears to be the stronger model when compared to the Multistore Model, as it explains findings related to performance differences discussed (Baddelley and Andrade, 2000; Baddeley and Wilson, 2002; Quinn and McConnell, 1996a, 1996b).

The addition of the Episodic Buffer (Baddeley, 2000, 2001) in the updated model (depicted below in Figure 2) is suggested to improve the model by allowing for the integration of information between the sub-systems of the Phonological Loop and Visuo-Spatial Sketch Pad as supported by Baddeley and Wilson (2002) who found good recall abilities of prose in immediate tests (thus requiring working or short-term memory) in amnesic patients with long term memory loss. Baddeley and Wilson (2002) state that the ability to recall these pieces of prose is dependent upon both the Episodic Buffer and Central Executive. Prabhakaran, Narayanan, Zhao and Gabrieli (2000) also found frontal lobe activation during tasks requiring the integration of information, thus, supporting the existence of an Episodic Buffer function within this location.

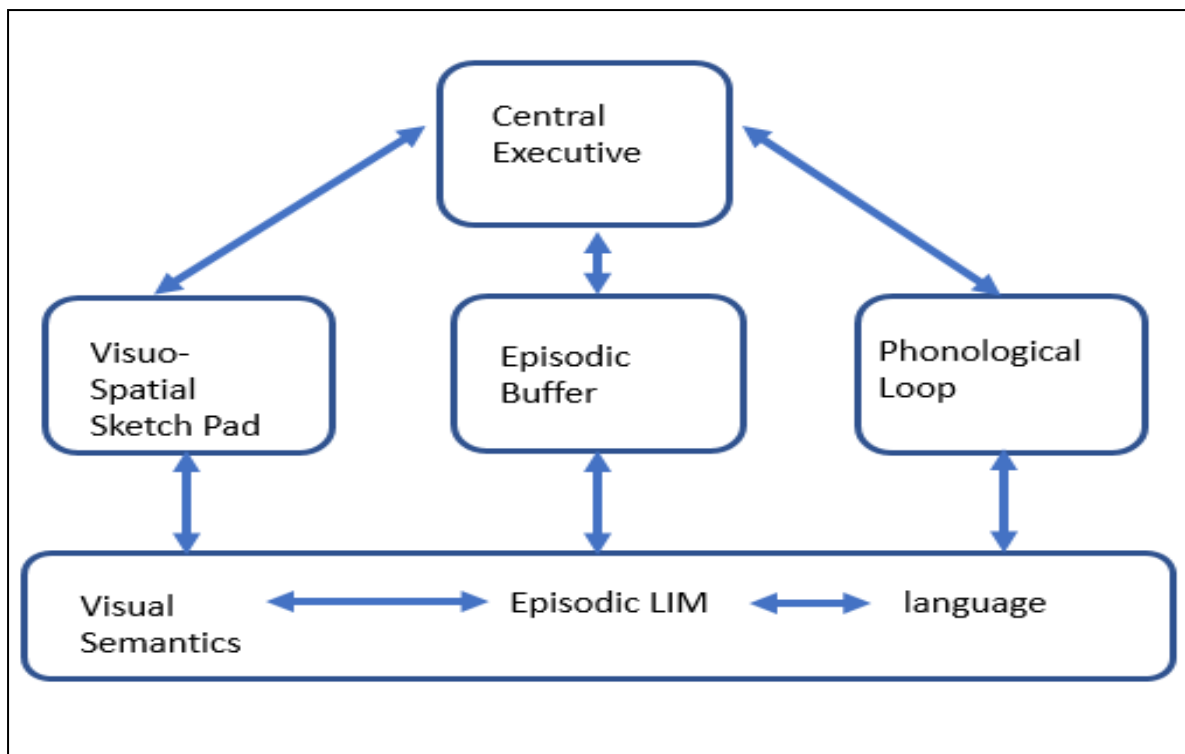


Figure 2: Baddeley's WMM (Baddeley, 2000).

The Episodic Buffer is said to have the ability to bind information processed via the other components creating a more cohesive unit of memory (Baddeley, 2001). This is useful in explaining the nature of episodic memories and allows for representations of episodes to store both visual and phonological information together. However, the capacity of the Episodic Buffer is limited, and conscious awareness is thought to be a requirement for processing within this component. For inattentive witnesses, this means that while the Episodic Buffer is actively binding information being attended to, the target information which lacked attention may only be processed via the Phonological Loop and Visuo-Spatial Sketch Pad with this information not necessarily being bound to the episodic unit of memory. For inattentive witnesses this may cause additional difficulty in retrieving information of interest with target memories potentially being stored in a less cohesive manner. This does not mean the information cannot be stored or recalled later though as the Central Executive oversees, prioritises and allocates resources across the working memory system. In this way, the Central Executive holds control over the sub-systems (Baddeley, 2001).

The Central Executive can, therefore, allow for the storage of information from any of the three components. Unattended information may therefore be retrievable but with more difficulty due to being stored in smaller separate components in memory in comparison to

the more cohesive units of memory produced by binding of attended memories in the Episodic Buffer. This also suggests that cueing of information for recall may be less successful in inattentive memories due to a more fragmented storage of details, as discussed in the associative network model (Anderson and Reder, 1979) of memory and spreading theory (Anderson, 1983).

A crucial link to long-term memory, therefore, is the pathway through working memory. It is the responsibility of the Central Executive to integrate information from other components (Phonological Loop, Visuo-Spatial Sketch Pad and Episodic Buffer) as well as from long term memory. The Central Executive plans and co-ordinates information and the related processing but does not store information (Matlin, 2009). This means that the Central Executive is vital in attention allocation; be it implicit or explicit (Baddeley, 2001) but is also the least well-understood component of the WMM due to the difficulties involved in studying it (Baddeley, 2006, Bull and Espy, 2006). Baddeley (2006) suggests that the Central Executive works to prioritise and allocate attention according to task requirements, saliency, etc, while ignoring superfluous information as well as having an ability to multi-task to a degree (Baddeley, 2001).

Larsen, Baddeley and Andrade (2000) provided further support for the WMM and its components as well as for the levels of processing framework ( Craik, and Lockhart, 1972; Craik and Tulving, 1975) (see also Hoosain and Salili, 1988). Similar words were found to be more difficult to recall than dissimilar words perhaps due to confusion during rehearsal (Larsen et al, 2000). In the same way, the word length effect observed by Hoosain and Salili (1988) shows that polysyllabic words are less well recalled than monosyllabic words. Their shorter length and less complex constitution mean more words can be rehearsed (Hoosain and Salili, 1988). These similarities and word length effects show that more difficulty is had recalling similar or complex words seen in the studies. This supports suggestion of the WMM in which components in memory perform processes rather than simply storing information (Baddeley, 2001). In agreement with the Baddeley's (2001) WMM, Logie (1995) theorises that there exist different systems of memory for temporary and permanent storage. However, the WMM suggests that visual and spatial processing of information occurs within the same structure. While Reisberg and Logie's (1993) model is structured in a manner whereby the

responsibilities of the Visuo-Spatial Sketch Pad are split between to further separate but interlinked sub-components.

Reisberg and Logie's (1993) model contains both a visual cache and an Inner scribe which carry out the duties proposed by Baddeley et al., (1986) as the responsibility of the Visuo-Spatial Sketch Pad alone. The two systems are proposed to be linked and able to pass information between them but remain distinctly different in function and duration. In contrast to the WMM Logie states that visual and spatial working memory are processed separately by entirely separate systems. The model suggests that the inner scribe performs the task of re-creating the spatial layout of the visual representations of features of the environment information stored within the visual cache in such a way that it is possible to mentally 're-draw' the target scene (Logie, 1995 and 2011). Whereas the WMM's visual-spatial sketchpad suggests these processes are conducted together but bound by the Episodic Buffer into a cohesive unit (Reisberg and Logie,1993). While vast empirical support is available for the proposition that temporary memory traces are held in a different storage system than permanent memory traces (Coltheart, Laming, Routh, and Broadbent, 1983; Logie, 2011; Norman, 1968) less evidence is available for the separation of visual and spatial information processing (Logie, 2011). However, the findings of Farah, Wilson, Drain, and Tanaka,. (1998). support the Visuo-Spatial Sketch-Pad component of the WMM (Baddeley, 2000), finding that patient LH, who has brain damage, could easily perform spatial tasks normally, such as, mentally rotating objects but has impaired performance on visual tasks like, relative size judgments. This supports Logie's (1995) suggestion that visual and spatial tasks are dealt with separately by the visual cache and inner scribe.

A further assertion made by Logie's (1995) model that is perhaps more controversial, and less well supported in the literature suggests that information enters the visual cache and inner scribe via a long-term memory representation. It states that information is not able to enter from sensory input and that this is the case for all components of working memory (Logie, 1995). Following this perspective, the rehearsal process engaged in does not necessarily contribute to entry into long-term memory, but it may dictate the strength of the memory trace or the level of connectedness of information and therefore determining durability and likelihood of retrieval according to the Encoding Specificity Theory (Tulving and Thompson, 1973). Encoding Specificity Theory states that the recall of memories is

determined by the amount of featural overlap between the memory trace developed at the time of encoding and those activated during retrieval; retrieval according to the Encoding Specificity Theory is therefore cue-dependent (Tulving and Thompson, 1973; Dando et al, 2009a; Davis, McMahon, and Greenwood, 2005). If this is correct alongside the possibility that information may be held in long-term memory without engagement with working memory, then inattentive participants may hold information they are not aware of which could be recalled using the correct cue. The idea that entry into long-term memory is not dependent upon entry into short-term memory is counter-intuitive to most mainstream models including those discussed above (Atkinson and Shiffrin, 1968; Baddeley, 1986, 2001; Murdock, 1974). It is generally agreed that the opposite pathway best explains the passing of memories between storage systems with information from sensory input being required to first travel through the short-term memory prior to entry into long term memory (Baddeley, 1986, 2001).

Direct entry to long term memory also presents a problem for inattentive witnesses in that the information having not been engaged with rehearsal would not strong memory traces therefore making retrieval of unattended information possible but challenging. Similarly, the WMM would suggest this to be the case as unattended information may be processed in the Visuo-Spatial Sketch Pad and Phonological Loop but not receive processing in the Episodic Buffer, important for binding information from different sources into a cohesive unit for memory storage (Baddeley, 2001). While this suggests that some memory facilitation techniques may be beneficial to inattentive witnesses, no research is available examining which techniques may be of use and whether they are appropriate for use with inattentive witnesses.

#### (In) Attention and Long-Term Memory

Early research into the effects of attention on memory indicates that when attention is diverted or distracted away from a to-be-remembered item, much of the information that may have been perceived and held temporarily in memory is quickly lost (Peterson and Peterson 1959; Ericsson, 1995). This rapid memory loss was initially thought to be due to the limited capacity of short-term memory storage, with a lack of attention preventing rehearsal, and thus preventing entry of the information into long-term memory. Subsequent interpretations favoured explanations relating to resources for memory-processing



limitations, rather than memory-capacity limitations ( Craik, Govoni, Naveh-Benjamin, and Anderson, 1996), including Craik and Tulving's classic levels of processing framework (1975)

The levels of processing theory (Craik and Lockhart, 1972; Craik and Tulving, 1975) suggests that the strength of a memory trace at retrieval is a by-product, highly dependent on the depth at which the information is originally encoded. It proposes that information is processed or encoded across a spectrum of levels. These levels of processing can be thought of as a continuum from shallow to deep. When processing information at a shallow level, only superficial features such as phonetic information, and basic visual information such as colour and shape are included. As more semantic and meaningful information becomes incorporated, the level or depth of processing increases, with higher levels being considered 'deeper encoding'. Each 'level' is responsible for the processing of different features of the stimuli. At a shallow level, the physical and sensory features are processed such as the lines, angles and brightness of visual stimuli and the pitch and volume of auditory stimuli.

At increased processing depths, higher levels of semantic and cognitive analysis take place making use of information incorporated from previously stored memories. At these deeper processing depths both top down and bottom up processing is required to determine semantic meaning of information by associating sensory input with this previously stored knowledge. Further elaboration, association, and analysis is proposed to deepen the level of processing of the stimuli thereby creating a stronger memory trace, the strength of these memory traces is known as trace persistence for the perceived stimuli. Therefore, Craik and Lockhart suggest that trace persistence is a positive function of depth of processing with the strength of the memory trace increasing as the depth processing increases (1972; see also Craig and Tulving, 1975).

According to the levels of processing model the attentive customer in the store, from the hypothetical example given above, would be considered a 'deep level' processor due to encoding intentionally and placing effort on remembering. Similarly, the inattentive witnesses such as the passer-by on the street, would be considered a shallow encoder due to encoding incidentally and the lack of awareness of the importance of their experiences (Craik and Lockhart, 1972; Craig and Tulving, 1975). Importantly, memories encoded at a shallow level are encoded in a bottom up manner and recall is generally deprived of detail and accuracy (Craik and Tulving, 1975). These memories are also said to be fragile and highly susceptible to

decay and contamination from external sources ( Craik and Tulving, 1975). Memories processed at a deeper level are generally more complete in detail, more accurate and more resilient (Craik and Tulving, 1975; Morrison and Zander, 2008). Anderson and Reder (1979) present an alternative viewpoint, disputing the depth of processing theory presented by Craik and Lockhart (1972). This perspective suggests that rather than the variance in memorial performance being influenced by the 'depth of processing', a measure of processing quality during encoding, it is rather a function of 'breadth of processing'. Anderson and Reder (1979) explain that the quantity of elaborations on information made during encoding may provide a more accurate predictor of memorial performance. In addition, this approach also suggests that these elaborations may be necessary for semantic encoding to occur in inattentive witnesses. With no strict guidance, as to what features 'shallow' and 'deep' processing in memories deals with this stance may be compelling.

Anderson and Reder (1979) suggest that as items are encoded, they are not only processed themselves but elaborated upon. This means target items are placed and represented in the memory network, but they are also interconnected to additional new and pre-existing items allowing the memory trace to be strengthened and in turn, increase the likelihood of its later retrieval (Anderson and Reder, 1979). Accordingly, if the breadth of processing/elaboration position is accepted, then it follows that manipulations of the quantity of items encoded (holding quality processing level constant) should better predict retrieval than the depth of processing or quality of processing (holding quantity constant). While this thesis does not explicitly aim to examine impact of the depth or breadth in processing as a distinction, both are considered as forming part of the theoretical basis showing that poor encoding does not necessarily result in lack of retrieval.

Building on levels of processing models, fuzzy-trace theory (Brainerd and Reyna, 1990; Reyna and Brainerd, 1995a, 1995b) suggests that rather than memories being processed in one format they may be processed in many different forms or levels from a fuzzy-trace 'gist' level of memory through to a 'verbatim' account considered to be exact in accuracy (Brainerd and Reyna, 1990). This idea of a continuum for memory encoding quality, and for retrieval abilities and the assumption that there should exist a correlation between them is a view that is shared by those who advocate for the acceptance of both the fuzzy-trace theory (Brainerd and Reyna, 1990) or the levels of processing theory (Craik and Tulving, 1975). The difference

between the two is that fuzzy-trace theory argues firstly that during memory encoding, imprecise representations are created and that inferences are taken from these. No such elaboration into the realms of cognitive inferences is made by the levels of processing theory (Brainerd and Reyna, 1990; Craik and Tulving, 1975).

Fuzzy-trace theory suggests that there is a bias towards low-level processing to preserve cognitive resources. It proposes that heuristics are likely to be in use where available and that inexact thinking; processing at a gist-based level takes priority over exact thinking and deep or verbatim processing is avoided unless heightened importance is perceived. These heuristics may result in schema-based intrusions in which incorrect details may be incorporated into memory via confabulation; fabrication or distortion of information, due schema consistency (Rubin and Kontis, 1983). In such cases recall becomes more representative of what is expected or well-fitting in the target scenario rather than accurate (Rubin and Kontis, 1983). Fuzzy-trace theory, somewhat counter-intuitively, suggests that gist memories are more likely to be retrieved following significant delays than verbatim memories, as well as being more accurate due to a lower distortion rate (Davies, 1995; Lindsay and Johnson, 1991).

Lindsay and Johnson (1991) find that cueing gist memories for previously encoded items in a word task resulted in more accurate recognition than cueing verbatim memory. Participants were shown two-word cards, one presented on the right and one on the left. While viewing the words participants were asked to either create sentences with the words presented or to count the number of 'e's present in words. In later recognition tests, participants answered old for words they recognised or new for words not recognised as previously presented. Participants recognised words from sentence construction tasks more often than words presented in later counting tasks. This supports the idea that words processed at higher levels, in this case, processed semantically, are more readily recalled with 89% of words recalled in comparison to 77% following letter counting at encoding (Lindsay and Johnson, 1991). These findings are in accordance with the levels of processing theory and fuzzy-trace theory. However, it was also found that participants had more difficulty accurately source monitoring; identifying the sources of details in memory, for information encoded during sentence construction than during letter counting). It may be reasoned, therefore, that shallow processing results in gist memories, but that these can be relatively robust (Brainerd

and Reyna, 1990; Craik and Tulving, 1975). For inattentive witnesses may then be able to provide information as to the gist of the encoded experience but may find it challenging to provide information which is specific and detailed.

Despite their low depth of processing, it has been shown that some level of encoding can occur for unattended information or by inattentive witnesses. Indeed, it has been suggested that 'incidental memories' (i.e., memories not actively encoded or deliberately processed) comprise much of the information held long term following shallow encoding (Castel, Nazarian and Blake, 2015). However, the retrieval of such memories is not always reliable. For example, when testing the memories of participants for fire extinguisher locations within their workplace very few could successfully recall these, despite them being purposefully placed in high visibility locations to increase awareness (Castel, Vendetti and Holyoak, 2012). However, once asked to locate the nearest fire extinguisher to their office of work, participants were rapidly (around 5 seconds) able to locate one during a visual search, albeit often not the nearest. The exceptional speed of accurate answers arguably suggests that some incidental learning of extinguisher locations had occurred even if these could not be cued by verbal prompting. Similarly, Vendetti, Castel, and Holyoak (2013) examined incidental memories for elevator control panels and found that most participants were unable to accurately depict the panel during a recall task, although they were able to later successfully recognise the correct panel design among other options. Furthermore, when participants were later asked to use the elevator to return to their office, the most participants could choose the correct button while the buttons were covered with blank labels further supporting the submission that a level of incidental processing had occurred during exposure. It may be that inattentive witnesses are able to hold and report information following inattentive exposure however it may be that incidental learning seen in the spatial tasks discussed above are due to repeated exposure or familiarity.

The lack of awareness high visibility and salient items has been termed 'inattentional amnesia' (see also Vő and Wolfe, 2012; Wolfe, 1999; Wolfe, Alvarez, Rosenholtz, Kuzmova, and Sherman, 2011, Castel, et al., 2015; Wolfe, Horowitz, and Kenner, 2005). It is suggested that overcoming inattentional amnesia is more likely if retrieval occurs in a goal-directed manner in which the exercise of recalling information is consciously directed with a specific set of target information in mind. This suggests that awareness of what type of information

is being sought may aid retrieval and potentially non-leading prompts may be useful for inattentive witnesses. Non-Leading prompts allow for the cueing of information directly while minimising suggestion, such techniques are discussed later in the chapter in the investigative interviewing section. This is particularly important given the implications for eyewitness recall within a forensic context.

Further support for improved retrieval of incidentally encoded information through goal directed recall can be derived from many similar studies in which frequently encountered items are shown to be difficult to recall unless the item has been exposed while relevant to a specified goal. Participants asked to recall coins (Nickerson, and Adams, 1979), keypads (Liu, Crump, and Logan, 2010; Rink et al., 1999; Snyder, Ashitaka, Shimada, Ulrich, and Logan, 2014), popular logos (Blake, Nazarian, and Castel, 2015) and road signs (Martin and Jones, 1998) have been shown to have a limited level of ability describing item features however, often mistaking the spatial information related to these features. Such findings imply that repeated incidental exposures to these frequently encountered signs produce little improvement in the accuracy of details (fine grain memory) while gaining accuracy in gist or coarse grain memories (Wolfe, 1998a, 1998b; Castel et al., 2015). It may be that particular types of information can be better recalled beyond gist, for example, involuntary musical imagery (INMI) or 'earworms', is the extremely common phenomenon of songs lingering in one's mind despite no external cue prompting this (Farrugia, Jakubowski, Cusack, and Stewart, 2015). This phenomenon may be contributed to by incidental memory as Hyman et al., (2013) points out that often the song lyrics and other verbal materials can become well learnt without any explicit attempt to do so.

The results of these studies may not be directly applicable to eyewitness memory due to the target information in such contexts being unique to an event rather than repeated. However, these findings relate to items which unlike most objects in our environment require a level of holistic, semantic and spatial processing in order to perform their function, for example to use a with proficiently requires familiarity keyboard a person does not examine carefully the letters on each key but rather types knowing the spatial positions of each key in relation to others. Similarly, road signs require the recognition of semantic differences beyond the sum of its features in order to not only identify the object as a sign but to effectively distinguish between various signs and react accordingly.

Curby, Glazek and Gauthier (2009) find that experts process objects of their expertise using holistic processing. In addition, Collishaw, and Hole, (2000) find that featural processing is relied upon more in the recognition of unfamiliar faces than familiar faces. For inattentive witnesses this suggests that as no efforts are made during exposure to a perpetrators' faces would likely be processed in a featural manner. Accurate recognition of perpetrators with distinctive features has also been shown to be higher than those without indistinct features as shown to be the case in line up research (Carlson, and Carlson, 2014). The processing of faces can therefore be both holistic of featural and moderated by familiarity increasing holistic processing (Curby, Glazek and Gauthier, 2009) and distinctiveness increasing featural processing (Carlson, and Carlson, 2014). This suggests that with familiarity comes holistic processing and with featural processing being relied upon more with unfamiliar stimuli and poses a question as to the usefulness of inattentive witnesses. If inattentive witnesses have weaker memory traces (Tulving and Thompson, 1973) following poor encoding (Anderson and Reder, 1979; Brainerd and Reyna, 1990, 1995; Craik and Tulving, 1975; Craik and Lockhart, 1972) which are less well connected (Baddeley, 2001; Tulving and Thompson, 1973) and less robust without familiarity (Curby, Glazek and Gauthier, 2009; Farrugia, Jakubowski, Cusack, and Stewart, 2015; Nickleson and Adams, 1979; Liu, Crump, and Logan, 2010; Rink et al., 1999; Snyder, et al., 2014; Blake, Nazarian, and Castel, 2015; Martin and Jones, 1998) then memories for unattended information in single exposure experiences such as in an eyewitness context may be lacking. Thus, the findings presented here suggest that while it is possible that inattentive witnesses may provide useful information the quality of such information remains unclear as does the process which may best facilitate retrieval. Currently no focus within either eyewitness memory or investigative interviewing literature is given to the topic of inattentive witnesses however attempts have been made to assess the reliability of witnesses not based on individual attributes but on the factors affecting their encoding experience.

#### Assessing the reliability of person descriptions

The circumstances under which eyewitnesses encode information is not always conducive to the needs of an investigative interviewer (Bromby and Hall, 2002). The estimator variables; those factors which cannot be controlled by investigators (Wells, 1978), involved in

encoding a typical eyewitness event often make it especially difficult to provide an accurate and full detailed account. When memory is negatively affected by estimator variables, such as poor encoding due to inattention, poor viewing conditions, and various other uncontrollable factors, the cards are stacked against investigative interviewers and the control they have over system variables (those variables which can be controlled and manipulated) become increasingly important (Wells, 1978).

A crime occurring over a brief time, involving mainly strangers, and which was unexpected may increase the likelihood of recalling errors and forgetting details just as inattention might (Haber and Haber, 2000). Although research findings cannot influence the estimator variables for any witness in the real world directly, it can aid the criminal justice system in knowing how to deal with them. For example, by either adapting system variables or by using the knowledge of estimator variables to make accuracy/reliability judgements regarding witness statements. Indeed, the impact of estimator variables are the focus of The Turnbull guidelines used to subjectively assess witness reliability (Bromby and Hall, 2002). These guidelines were developed following an appeal against a conviction of conspiracy to burgle (*R v Turnbull*, 1976, cited in Bromby, 2002). The appeal was based on the accusation that jurors ill-informed of the known flaws in eyewitness memory. Although the original convictions were upheld, growing concerns over the reliability of identification evidence were deemed grounds for the creation of Turnbull's guidelines which mandate that judges be required to caution the jury that witnesses may present as honest, confident in their memory, and be persuasive even when they are not accurate. The judge is also required to state that jury members should take into consideration estimator variables such as the amount of time that has passed between witnessing the event and the provision of evidence to police and to the court as well as the viewing conditions experienced at the time. Juries should also be made aware that misidentifications are possible whether the perpetrators are known to witnesses or not (Bromby and Hall, 2002).

Turnbull's criteria for assessing witness reliability, although not mentioning attention directly, implicitly urges legal decision-makers to consider perceptual and attentional features; amount of time under observation, distance, visibility, obstruction, known or familiar target, reason to remember, time lapse, error or material discrepancy (Bromby and Hall, 2002). These criteria provide legal decision makers with guidelines which can be used to

assess the reliability of identification evidence provided by witnesses and form part of a compulsory warning given to juries by judges in England and Wales (Bromby and Hall, 2002). Similarly, the Turnbull guidelines, translated into an acronym 'ADVOKATE' serves as a mnemonic to guide police officers' enquiries in the examination of witness reliability (Bromby and Hall, 2002). The ADVOKATE acronym outlines the eight factors examined below:

<p><u>ADVOKATE mnemonic</u></p> <p>A – The Amount or length of time the witness observed the perpetrator D – The Distance from the witness to the perpetrator V – The Visibility conditions at the material time O – Was Observation impeded either partially or temporarily K – Whether the perpetrator was Known to the witness in any way A – If there were any Reasons for Remembering the event or the perpetrator T – The Time elapsed since the event E – Whether there were any Errors in the description of the perpetrator compared to the appearance of suspects (if known).</p>
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*Figure 3: ADVOKATE mnemonic (Bromby and Hall, 2002).*

However, ADVOKATE does not provide information regarding the expectations of performance by reliable or unreliable witnesses (Bromby and Hall, 2002). This means that despite a guide being available, officers and juries may misjudge the reliability of witnesses because the perceived influence of each factor on the case is for the investigator, or jury member, to decide for themselves (Bromby and Hall, 2002). Turnbull's criteria may disadvantage inattentive witnesses who may be judged unfairly as unreliable despite their accuracy being unknown. Perceptions of inattentive witnesses being unreliable may then affect the opportunities afforded to inattentive witnesses to provide their 'best evidence'. In addition, the ability to provide information about the clarity, contextual attributes, time, relevance, thoughts and feelings, events before and after, frequency of consideration has been shown to distinguish well between true memories and imagined events and may contribute to the perception of information being erroneous (for review see Ost, Vrij, Costall and Bull, 2002). Inattentive witnesses may be less able to provide such information in comparison to attentive witnesses thus disadvantaging them further in terms of their perceived reliability. Reality monitoring criteria for the detection of deception may unfairly promote the perception of inattentive witnesses as being deceptive if their testimony lacks in clarity, completeness, realism, as well as perceptual, spatial and temporal information, all



factors associated with distinguishing between truth and lie telling (Sporer, 1997; Vrij 2000). From the factors discussed here it seems evident that an inattentive witness may be unfairly perceived as unreliable due to the type of information available to them rather than their actual accuracy which is currently unknown. Much of the ADVOKATE criteria consists of perceptions of estimator variables that cannot be controlled with the sometimes exception of 'T' or 'time elapsed', by ensuring evidence is gathered as quickly as possible the time elapsed can be minimised. While the majority of estimator variables can only be subjectively assessed regarding their contribution to recall after the fact, preventing delay can also prevent extraneous decay and contamination of memory, known to be a prevalent risk (Fisher, Brewer and Mitchell, 2009; Howe and Knott, 2015; Loftus, Miller, and Burns, 1978; Wells, 2018; Koriat, Levy-Sadot, Edry, and de Marcas, 2003; Kintsch, Welsch, Schmalhofer, and Zimmy, 1990; Lindsay, and Johnson, 1989b; Flin, Boon, Knox, and Bull, 1992). Indeed, the problem of delay has been a main contributor to the modification of interview process allowing for efficient capturing of eyewitness evidence through self-completion. Pioneered by Gabbert et al's., (2009) Self-Administered Interview (SAI) and influencing the creation of the FIND. Indeed, the provision of a "good recall opportunity" soon after exposure using the SAI has been shown to promote memory cohesiveness, robustness and protect against future contamination (Gabbert et al, 2009). The SAI and the use of self-completion methods may be beneficial to Inattentive witnesses, with potentially more fragmented memory representations in comparison to attentive witnesses (Tulving and Thompson, 1973; Anderson and Reder, 1979; Brainerd and Reyna, 1990, 1995; Craik and Tulving, 1975; Craik and Lockhart, 1972; Baddeley, 2001) as the opportunity to recall the information early in a cohesive manner may allow for the fragments to be re-bound in the Episodic Buffer (Baddeley, 2000), forming stronger memory traces (Tulving and Thompson, 1973) and allowing for the re-storage of a now more cohesive and robust memory for the event of interest.

#### Investigative Interviewing and Memory Facilitation

The concept of a 'good recall opportunity' is largely based upon the literature in investigative interviewing regarding cognitive and social factors influencing witness memory. Investigators aiming to facilitate recall of memories must be aware of the various factors

which may influence witness accuracy during the encoding process and afterwards including during the re-telling of their memories for the event of interest during interviews. The success of an interview shown by the quality of information obtained is dependent upon both a) the cognitive ability of the witness to retrieve information of interest and b) the interviewer's ability to listen and formulate appropriate responses contributing to the facilitation of the witnesses' report as well as c) the social factors involved in the discussion (Geiselman and Fisher, 2014).

Historically, eyewitness interview practices were unregulated resulting in many miscarriages of justice with officers receiving little formal training in this area and instead learning through experience (Milne and Bull, 1999). A growing understanding of the workings of episodic memory has promoted the use of this psychological knowledge in everyday practice. Indeed, psychological literature has dramatically influenced the development of guidelines and UK wide mandatory training in the PEACE mnemonic model (Planning and preparation, Engage and explain, Account, clarify and challenge, Closure, and Evaluation), used across England and Wales and the PRICE model (Planning and preparation; Rapport building; Information gathering; Confirming the content; and, Evaluate), Scotland's equivalent (See Williamson, 2006; Drummond, 2008). These guidelines aim to support the officer to conduct high quality interviews and the witness to produce their 'best evidence' (College of Policing, 2018). The overall quality of evidence produced is in part dependent on the quality of interview conducted (Geiselman and Fisher, 2014).

Many facilitative techniques have been introduced to the Criminal Justice System, for use in eyewitness interviews, however, the Cognitive Interview (CI) and The Enhanced Cognitive Interview (ECI) methods are considered by many researchers and practitioners alike to be the 'gold standard' of investigative interviewing based on current knowledge (Memon, Meissner and Fraser, 2010).

The original CI contains four cognitive components (also within the later developed ECI) based on memory enhancement techniques; the Mental Reinstatement of Context (MRC) technique, the Report Everything instruction, the Change Perspective technique and the Change Order technique and also suggests the use of question styles prompting Free Recall. The CI is based upon the cognitive research literature and aims to promote retrieval through cognitive mechanisms. The original CI (without social components) has been shown to

produce 35% more accurate information (Geiselman, 1984) than standard police interviews with no increase in erroneous recall.

In 1992, Fisher and Geiselman updated the CI to include new social components, recognising that social factors may inhibit or facilitate witness reporting, the updated procedure being known as the Enhanced Cognitive Interview (ECI). The ECI was in part a response to a murder investigation involving an inattentive witness. In this case the key witness had not seen the crime itself but had encountered two men in a lobby before the crime occurred who were thought to be potential suspects. This witness would be classified as an inattentive witness as there was little probability that the witness would have any knowledge of the perpetrators being significant in anyway during encoding or to have made effortful attempts to remember the perpetrators. Police officers using a standard interview were unable to gain any useful information from the witness. After being interviewed using additional memory enhancement techniques as well as Rapport Building strategies suggested by Fisher, the inattentive witness's ability to describe the perpetrators in this case was greatly facilitated and of vital importance in the apprehension and prosecution of the perpetrators as no other witness evidence was available (Bower, 1997). Despite this case being an influencer upon the creation of the ECI the majority of research examining contemporary investigative interviewing makes use of attentive witnesses with little research examining the facilitation of memories following encoding circumstances similar to the lobby encounter in this case.

Fisher and Geiselman (1992) suggest that Rapport Building may promote the effects of cognitive facilitation techniques in addition to putting the witness at ease aiding the process of retrieval. The ECI was therefore developed to incorporate social components which promote both rapport and report including: Establishing rapport, Active listening, the use of open-ended questions, the use of pauses, avoidance of interruptions, explicit requests for detail, encouraging concentration, the use of eyewitness compatible questions and adoption of the witnesses' perspective (Fisher, Geiselman, Raymond, and Jurkevich, 1987; Fisher, Mackinnon and Holland, 1985, 1986). The addition of social components is shown to produce a further increase of 45% in accurate information recalled over the CI with no increase in erroneous recall (Geiselman and Fisher, 1997).

The development of CI and ECI was a turning point in investigative interviewing with the realisation that witness recall can be improved through the techniques used by investigators (system variables) prompted wider attention in the area of memory facilitation. When compared to other interview procedures such as conversation management (Shepherd, 2007), standard police interviews (Malpass and Devine, 1981; Geiselman, 1984) guided memory interviews (Malpass and Devine, 1981), structured interviews (Memon et al., 1997) and hypnosis (Geiselman et al., 1985), each time the CI or ECI has been found to outperform the compared techniques. Memon and Köhnken (1992) conducted a meta-analysis exploring the use of the CI and ECI within research. It was concluded that the previously mentioned benefit of additional information without loss of accuracy was found to be a robust effect of the ECI leading to the ECI being seen in the researcher and practitioner communities as being the superior method of interviewing setting the standard for 'good interviewing procedures. Although Some critique of the (E)CI (discussed below) is observable within the recent literature limitations have generally been overcome by modifications and adaptations to the (E)CI with no novel procedure taking prominence.

#### Cognitive Memory Facilitation

Bensi, Nori, Gambetti and Giusberti (2011) found that a shortened ECI with the change perspective and change order techniques removed was equally as effective as the full ECI in eliciting accurate information. The multi-component structure of the ECI means that an effect known as the ECI superiority effect (Griffiths and Milne, 2010); in which all components appear beneficial on the basis of the overall impact. This has led to a less structured use of the CI and ECI in real world interviewing with investigators making use of some components without others (Dando, et al., 2009a; Griffiths and Milne, 2010). Researchers have also taken to focussing on singular components of the CI and ECI. When examined as individual components the change order and change perspective techniques have limited value for witness recall generally however may be of use in specific circumstances.

Both the Change Order technique and the change perspective technique work to increase the overlap between encoding and retrieval cues. In this way additional information can be gained by recalling information using different retrieval routes or memory cues as suggested by the Encoding Specificity (Tulving and Thompson, 1973). In the change order

technique, this involves recalling the event in various temporal orders Kebbell, Milne, and Wagstaff, (1999) while the change perspective technique a witness may be asked to describe the scene from the perspective of another. For example, following chronological order recall a witness may be asked to recall the event again in reverse order. In addition, witnesses may be asked to focus on what occurred between two, time points, or to recall the information they remember best first regardless of the timing. Using repeated recall attempts in various orders witness may be able to access additional or perhaps multiple routes to recall of information (Geiselman, Fisher, MacKinnon and Holland, 1986a). The creation of this technique was also influenced by work on schema memory with the hope of decreasing schema related errors being made as this is thought to be less likely to occur when recalling information in non-chronological order, perhaps due to the increased cognitive load required for this task (Schank and Abelson, 1977; Davis, McMahon and Greenwood, 2005). This task therefore may be of particular use in incidents where schema-based thinking is likely to occur such as when a witness encoded events under the influence of alcohol (Köhnken, and Brockmann, 1987).

The change perspective technique is based on the same principles requiring the witness to recall the event from the perspective of another. They may be asked to describe the scene as they may have seen it from another direction or from the point of view of other witnesses (i.e. what would the other witness have seen from where they were standing). Alternatively, some have interpreted this technique further by requesting witnesses to describe clothing as though they were a fashion designer or describe hair in the way a barber would (Personal communication, Milne, Memon and Westera, IIRG, 2011). While this technique was thought to increase fine grain recall through additional focus on particular pieces of information.

Despite these techniques aiming to limit schema-based reports they has been found to counter-intuitively increase erroneous reporting. These techniques have been criticised as being potentially suggestive as they actively encourage the use of cues not personal to the interviewee although ECI has been shown to reduce susceptibility to suggestions and misleading information overall when compared with standard police interviews (as found by Geiselman, et al, 1986b) this is thought to be due to the ECI superiority effect (Griffiths and

Milne, 2010) with shortened ECI's without these components being equally as effective as the full ECI in eliciting accurate information (Bensi, et al., 2011).

The findings above suggest that the use of the change perspective and order techniques should be used where appropriate and necessary rather than as a generic practice and implemented on a case by case basis. In contrast the MRC and Report Everything technique are seen as more beneficial for generic use (Bensi, Nori, Gambetti and Giusberti, 2011; Dando, et al., 2009a, 2009b; Griffiths and Milne, 2010).

The MRC technique aims to aid witnesses in mentally re-creating the context of the witnessed event. Through investigator delivered, verbally presented contextual cues, the witness is encouraged to concentrate intently on listening and re-creating the 'to be remembered' experience (Dando, et al., 2009). Guidance around the delivery of cues states that time should be taken over presentation with deliberate pauses being included following each prompt (Dando, et al., 2009). It is also advised that witnesses are encouraged to concentrate with the option of using eye-closure to aid mental visualisation. Eye closure alone has since been found to be useful in aiding recall while using MRC instructions (Nash, Nash, Morris, and Smith, 2016; Vredeveltdt et al., 2011, 2015). Following some time spent visualising the scene witnesses are then asked to freely recall everything they can remember about the experience with the inclusion of an instruction to Report Everything even if details are believed to be unimportant or irrelevant (Davis, McMahon and Greenwood, 2005). The theoretical basis of MRC tasks are based upon the Encoding Specificity Principle (Tulving and Thompson, 1973).

The Report Everything technique helps officers to address the issue of withheld information by highlighting the investigatory priority to gather as much information as possible rather than an overview. This may alter witness's meta-cognitive strategies and thus, their report increasing recall. Meta-cognitive judgments allow witnesses to self-monitor their reports and often determine what information is reported and withheld based on confidence and perceived accuracy (Evans, 2008). If meta-cognitive judgments work successfully as intended, then accuracy should increase. Indeed, report or withhold decisions have been shown to influence both the amount of information provided and the level of granularity of reported information (Wolfe, 1998a;1998b; Castel et al., 2015). Koriat and Goldsmith (1994) show evidence of this trade-off whereby participants who withhold more information achieve

higher accuracy rates. Yaniv and Foster (1995) found similar trade-offs between the level of precision and grain size of information reported. For investigative officers, it is often preferable to gain more information, which can be checked for accuracy later through analysis of other corroborating evidence where available, thus, the inclusion of the 'Report Everything' instruction may have a positive impact on the investigation.

Reminding witnesses that all information is to be reported, potentially avoids the loss of important details which the witness perhaps believes may not be accurate or relevant however, use of this instruction is not without criticism as accuracy has been shown not to correlate with confidence (Koriat and Goldsmith, 1996). In addition, the use of such meta-cognitive judgments and discussion of the experience itself may increase confidence regardless of accuracy (Goodwin, Kukucka, and Hawks, 2013; Thorley and Kumar, 2017; Rechdan, Hope, Sauer, Sauerland, Ost and Merckelbach, 2018). This is potentially due to the witness's belief that they are able to dismiss any inaccurate information thereby inflating accuracy at the cost of quantity (Koriat and Goldsmith, 1994) as well as the discussion of the experience acting as memorial rehearsal reinforcing and consolidating memories. Conversely, it is known that high confidence does not necessarily co-inside with high accuracy. Indeed, Perfect, Watson and Wagstaff (1993) find high correlations between confidence and accuracy for general knowledge but low confidence and accuracy correlations for eyewitness memory thus suggesting that confidence cannot be used as a measure of reliability in eyewitnesses (Sporer, Penrod, Read, and Cutler, 1995). Despite this confidence has been found to be a better predictor of jury decision making than consistency of testimony (Brewer and Burke, 2002). The evidence presented here suggests that while the Report Everything instruction may be useful in the gaining of evidence it may be problematic in relation to the potential to falsely inflate confidence.

The Sketch-MRC component developed after the CI as a modified component is also shown to facilitate memory (Dando, Wilcock and Milne, 2009a; 2009b). The sketch component encourages the use spatial cues to facilitate recall. Drawing the scene While reinstating the context may have a facilitative effect on recall while providing a common reference point for interviewers in order to aid two-way communication and prevent misunderstandings from disrupting report Dando, Wilcock and Milne (2009a; 2009b). The facilitative effects observed by Dando, et al, (2009a) are supported by the Encoding Specificity

theory which states that higher degrees of overlap between the cues available at encoding and retrieval results in more information being recalled and reported (Tulving and Thompson, 1973). While re-instating the context may have a facilitative effect on recall if retrieval cues are appropriate and consistent with encoding cues, memory retrieval may be impaired if cues provided are not consistent with encoding cues (Tulving and Thompson, 1973).

It is suggested that attentional focus at the time of encoding may mean inattentive and attentive witnesses respond differently to context reinstatement techniques as unattended memories are less well bound having received less processing in the Episodic Buffer (Baddeley, 2000). Wheeler and Gabbert (2107) suggest that self-generated cues can be used to reinstate the context of witnessed memories using a more witness compatible method to improve recall. This also fits well with the findings related to the self-reference effect in which memories for stimuli are remembered better when they are related to the self (Bellezza, and Hoyt, 1992; Cunningham, Brebner, Quinn, and Turk, 2014; Turk, Cunningham, and Macrae, 2008; Cunningham, Vergunst, Macrae and Turk, 2013; Cunningham, S. J., Turk, D. J., Macdonald, L. M., and Macrae, C. N., 2008). Prompts can also be lacking in witness compatibility if discussed in a different order, using different terms or in some other manner are less compatible with the retrieval strategies of the witness. For example, Interviewers often have access to information not known to the witness which poses a risk of interviewers inadvertently introducing information that is new to the witness, the use of self-generated cues through generic prompting in self-completion interview may be an efficient facilitative measure, however, it remains the case that little is known regarding the response of inattentive participants to MRC techniques.

Both the MRC technique and the Report Everything technique aim to increase in overlap between the encoded materials and the information available during recall attempts by accessing additional memory traces through memorial cueing. Each of these techniques are viewed as beneficial and appropriate for generic use. However, the cognitive literature discussed related to memory for unattended information suggests the MRC may not benefit and indeed may be detrimental to inattentive witnesses' retrieval attempts as these memories are likely to be stored in a less cohesive manner with theoretically less frequent cue overlap (Baddeley, 2000; Tulving and Thompson, 1973; Wheeler and Gabbert, 2017). While the MRC according to the aforementioned cognitive literature may be limited in its



ability to increase inattentive recall, any facilitative effect is likely to be cue dependent in that interviewer generated cues may be more detrimental to inattentive witnesses with an alternative perspective having less of a shared knowledge with the investigator than attentive witnesses. Report Everything instruction may support inattentive witnesses in their recalling more information as this is not cue dependent but rather is focussed upon providing a meta-cognitive framework on which report/withhold judgments should be made allowing for uncertainty to be reported alongside the information of interest. This is particularly important in face to face interviews where both child and adult participants are found to feel social pressure to provide answers to questions regardless of confidence in their answer, thereby increasing the risk of inclusion of errors in their report (Dent and Stephenson, 1979a; 1979b).

### Social factors influencing eyewitness memory

The social interaction between the interviewer and interviewee is also of great importance during verbal face to face interviews. In addition to the challenges that inattentive witnesses may face regarding delay and reliability judgments, they also may lack in confidence in their memories. Meta-cognitive judgments; that is judgments made with awareness of one's own thought processes, about one's ability to report accurate information may which may result in the withholding of information or the altering of the granularity reported by inattentive witnesses (Koriat and Goldsmith, 1994). These methods allow individuals to self-monitor their accuracy over time, adjusting according to confidence in their memory (Evans, 2008). Koriat and Goldsmith (1994) find evidence of a confidence-accuracy trade-off, whereby confidence in given information is raised within the individual, as they believe themselves to be dismissing inaccurate information rather than reporting it. By withholding information that they are not confident in, accuracy may be inflated, and the quantity of information provided to investigators reduced. For investigative officers, it is often preferable to gain more information, which can be checked for accuracy later through analysis of other corroborating evidence.

In face to face verbal interviews Rapport building is observed to increase the amount and accuracy of information recalled by adult mock witnesses (Vallano and Schreiber Compo, 2015b; Vallano, Evans, Schreiber Compo, and Kieckhaefer, 2015a; Kieckhaefer, Vallano, and Schreiber Compo, 2014) and it is thought that the more comfortable and at ease a witness is

the more accurate their recall ought to be (Collins, Lincoln and Frank, 2002; Holmberg and Madsen, 2014; Kieckhaefer, Vallano, and Schreiber Compo, 2014; Villalba, Vallano, Schreiber Compo, and Kieckhaefer, 2013). However, understanding the influence of Rapport Building is multi-faceted with varying definitions standards and guidance regarding what constitutes Rapport Building.

In clinical settings establishing a 'therapeutic alliance' is seen to be of prominent importance in which the primary function of Rapport Building is to increase affinity between the therapist and client while prioritising long term well-being (Bedi, Davis, and Williams, 2005). Investigative interviewers while concerned about witness well-being, also have to prioritise the need to obtain evidence. Unfortunately, even following the introduction of interview guidelines such as the Cognitive Interview (Fisher and Geiselman, 1992) and Eyewitness Evidence: A Guide for Law Enforcement (Technical Working Group on Eyewitness Evidence, 1999) recommending Rapport Building be implemented this is often lacking. Indeed, Collins, Lincoln, and Frank, 2005) find a lack of agreement across therapeutic settings regarding how best to increase a communicative alliance between the interviewee and interviewer using Rapport. Fisher, Geiselman, and Raymond (1987a, 1987b) find that prior to the introduction of the ECI Rapport Building was often not a priority with investigators being task focused and perhaps not understanding of the benefits of Rapport Building or indeed how best to achieve good rapport.

The ECI emphasises the use verbal techniques such as Active Listening, echo statements and facilitators, the use of open ended questions showing interest in the interviewee as an individual, the use of the interviewees name and the self-disclosure of personal information by the interviewer to the witness (Bedi, Davis, and Williams, 2005; Collins and Miller, 1994; Psychopathology Committee of the Group for the Advancement of Psychiatry, 2001) with similar concepts seen in the clinical literature examining therapeutic alliance (Bedi, Davis, and Williams, 2005; Collins and Miller, 1994). Non-verbal behaviours such as open body language may also impact upon the building of rapport (LaFrance, 1979; LaFrance and Broadbent, 1976; St-Yves, 2006). In addition, Ackerman, and Hilsenroth (2001) in a review of therapist characteristics suggest that the personality traits and attributes can impact upon the therapeutic alliance. It is beyond the scope of the current programme of work to fully explore the effect of social factors upon inattentive witness' reports as doing so

would decrease both experimental control and the potential observability of differences in cognitive process as indicated by retrieval. Thus, the current thesis controls for social factors mainly by limiting social influence using self-completion retrieval tasks. This also facilitates the need for further testing of self-completion witness reports as inattentive witnesses, unlikely to be prioritised for verbal interviews may be an untapped evidential resource if able to provide accurate evidence.

### The Self-Administered Interview

The high success of E(CI) methods has provided the criminal justice system with a valuable and worthwhile tool and has influenced the creation of other useful tools with the effective use of resources being a priority for the Criminal Justice System (Williamson, 2006; Drummond, 2008; Poole, Lindsay, Memon, and Bull, 1995; Kebbel and Milne, 1999; Dando, Wilcock, and Milne, 2008; Gabbert, Hope and Fisher (2009). Barriers to the use of cognitive interviewing remain as the process is time and resource intensive as well as cognitively demanding (Dando, et al, 2008). It is not recommended that investigators disregard the (E)CI, but rather that more efficient recall methods must be developed, and the procedures of interviews diversified (Poole, et al., 1995; Kebbel and Milne, 1999).

Indeed, both social and cognitive components are perceived as difficult to implement and can be mis-understood (Dando, et al., 2008). Delay is also known to cause memories to fade and become less retrievable however can also be made more robust with the provision of early recall attempts having a preservative effect (Brock and Cutler, 1999; Ebbesen and Rienick, 1998; Gabbert, Hope and Fisher, 2009; McCauley and Fisher, 1995). The associative network model suggests this may be because memory traces become less accessible over time thereby increasing forgetting of information (Anderson, 1983; Ayers and Reder, 1998). This may be particularly impactful for inattentive witnesses who may suffer more memory deterioration due to already weaker memory traces (Anderson, 1983; Ayers and Reder, 1998) which are less well-bound (Baddelley, 2001) and are encoded at gist using shallow or narrow processing levels (Brainerd and Reyna, 1990, 1995; Craik and Tulving, 1975; Craik and Lockhart, 1972). An early retrieval opportunity could re-activate memory traces thus, strengthening and consolidating the various fragments of memory (Anderson, 1983; Ayers and Reder, 1998; Damasio, 1989). Information re-accessed in working memory prior to the

effects of decay may be afforded a second opportunity for binding to occur in the episodic buffer creating a more cohesive memory representation and theoretically aiding later recall (Baddeley, 2000).

Drawing upon the facilitative principles which shaped the success of the (E)CI. The Self-Administered Interview (SAI) was developed By Gabbert, Hope and Fisher (2009) to provide a time and resource efficient method of recording memories while minimising both social influence and cognitive demand.

The SAI makes use of the cognitive principles inspiring the (E)CI while advancing upon these with a design appropriate for general use, in a variety of scenarios, and in a self-administered manner. The SAI takes the form of a written self-completion witness report booklet containing techniques influenced by and adapted from the (E)CI (Gabbert, Hope and Fisher, 2009). The SAI does not include representation of the change perspective and change temporal order techniques but does represent other techniques viewed as beneficial to witness memory such as the use of FR instructions (Lamb, La Rooy, Malloy, and Katz, 2011), MRC instructions (Memon and Bull, 1999; Geiselman and Fisher, 2014) with 'eye closure' (Vredeveltdt, Tredoux, Kempen, and Nortje, 2015), the 'Report Everything' (Geiselman and Fisher, 2014) and the sketch MRC component (Dando, et al., 2009a; 2009b).

The SAI contains six sections; task instructions, context reinstatement, person description cues, vehicle description cues, spatial sketching and additional prompts. Some features of the ECI directly influenced the development of the SAI which includes for example an MRC exercises (both prompts and a sketch MRC) and the Report Everything instruction, as well as FR prompting the inclusion of non-leading memorial cueing.

The SAI also provides non-leading memory cues relevant to person descriptions such as 'Gender, ethnic origin, hair, clothing, shoes etcetera. This allows for the prompting of memory without the inclusion of suggestive details. These cues should act to increase retrieval By re-activating memory cues other than those initially recalled This may activate further memory retrieval as according to the principles of Encoding Specificity and Spreading Activation (Tulving and Thompson, 1973). This may activate further memory retrieval as generic cues, and additional prompts may all contribute to facilitative effects of the SAI. The use of generic cues and prompts rather than event specific prompts may contribute to the high accuracy rate of the SAI even when recall is inattentive as generic prompts may

encourage the witness to self-generate more specific prompts that are personally relevant rather than the potentially less witness compatible interviewer generated prompts used in (E)CI procedures as suggested by Wheeler and Gabbert (2017). It is therefore proposed that generic instruction may prevent the proposed impaired accuracy suggested by the WMM structure (Baddeley, 2000) and the encoding Specificity theory of retrieval (Tulving and Thompson, 1973) was with inattentive witnesses being observed to produce accurate recall.

The dismissal of the change perspective and change temporal order techniques as well as limited social support which could not be represented in the SAI does not appear to have prevented the benefits of the (E)CI being transferred with equally accurate recall at immediate test between the SAI and ECI conditions. Participants who had completed the SAI previously also recalled more information in the delayed FR task than control participants (without a recall opportunity) while no significant difference in accuracy was found between those who has previously completed a ECI and SAI after a one-week delay (Gabbert et al., 2009). The shortened CI used and the SAI excluded the use of change perspective and change order techniques to give an equivalent to the SAI and as suggested by the findings of Memon, et al., (2010). Gabbert et al's (2009) Findings show that the SAI and shortened CI both significantly outperformed a baseline FR task (baseline measure of unfacilitated retrieval) but did not show differences in amount or accuracy of information recalled between them. This is an impactful result as the benefits of the ECI are seen here to be matched by the SAI. This has the potential to be hugely beneficial to practitioners in preserving eyewitness evidence with minimal additional burden being placed upon resources.

This further suggests that of the cognitive components the MRC and Report Everything instruction are important contributors the SAI's and (E)CI success and suggests that social factors are controlled for as well in the SAI as in the ECI procedure. The SAI is therefore found to be a reliable and efficient tool with no accuracy cost meeting the standard of the already heavily endorsed (E)CI. In cases where social support is not required the SAI also provides a facilitative means by which witnesses can record memories preventing decay and contamination (Gabbert et al, 2009).

In Gabbert et al's (2009) lab tests findings show that the SAI and CI both significantly outperformed a baseline FR task but did not show differences in amount or accuracy of information recalled between them. This is an impactful result as the benefits of the CI are

seen here to be matched by the SAI. This has the potential to be hugely beneficial to practitioners as the SAI requires fewer resources than the CI but produces information of matched quantity and accuracy. On the other hand, it is not recommended that investigators disregard the CI, but rather that each of the tools are useful in their own way. For example, The SAI leaves less room for follow up enquiries for information from the investigator. It also may be lacking in social elements present in the ECI dependent on the delivery of the SAI and the level of social interaction witnesses receive from investigators outside of completing the SAI. It is for this reason that it should be completed as early as possible and may be a good alternative to the current practice of taking initial accounts. Indeed, work is underway to address such an issue with a UK College of Policing Supported project examining field trials of a structured initial account protocol developed to be followed by either an SAI or interviewer present interview.

Hope et al., (2011) present findings of field trials in support of the SAI's effectiveness within real-world investigations . The SAI can be distributed in large quantities by response officers at the scene of a crime and the surrounding area and therefore, may be particularly useful In cases where the number of potential witnesses exceeds the resources available to deliver prompt recording of witness reports. SAI reports might aid in the minimising of delay and can be used as a screening tool to identify key witnesses for follow up verbal interviews as a priority while enabling all witnesses to provide and protect their evidence against decay and contamination (Gabbert et al., 2009).

With the effects of delay on memory being well known and favourable findings regarding the SAI's use in preserving and recording witness memory, Hope et al., (2011) began conducting field trials within UK police forces (Gabbert et al., 2009; Hope et al., 2011). The key feature of this tool is its self-administered nature, which ensures effective use of police resources. Hope et al., (2011) present a case study in which a road traffic accident resulted in death. Sixteen witnesses were present at the scene of the crime. Those not identified as key witnesses and prioritised for follow up interviews were asked to complete SAI's. Seven SAI's were collected, and it was found that on average witnesses provided 54 lines of text describing the event. This information would have been lost to investigators otherwise as these witnesses had not been identified for follow up interviews. In addition, while no measure of accuracy was available, five of seven witnesses provided information which

corroborated that of another. All witnesses to the accident completing the SAI were found to provide both relevant fine grain information and relevant coarse grain information. Investigators concluded that the SAI's collected provided a complete and detailed account useful to the investigation (Hope et al., 2011). Indeed, the information provided by witnesses using the SAI led to the identification of three further key witnesses previously unknown to investigators who were later requested to give formal statements. Officers working on the case agreed that the SAI had increased the efficiency of the investigation. In addition, Of the officers surveyed, 38% involved in the administration of use of the SAI to witnesses during field trials stated that trials were 'very successful' (Hope et al., 2011). Following the promising trial findings, a training package has been developed and made available. In addition, a survey of Police officers found that all who had used the tool to report their own memories for incidents witnessed while on duty found it to be useful with the majority stating that the tool saved them time.

The success and usefulness of the SAI is evident with the tool now being adopted by many police forces internationally (as many as 36; Personal Communication, Gabbert, iILRG, 2014). The SAI has also now been allowed to be admitted into court as evidence in chief in the UK, much as a witness statement would be in their absence (Gabbert and Comfrey, 2014). This all attests to the impact such tools can have within the criminal justice system in the future, providing they are of sufficient comparable quality to current methods being used. The SAI achieves this standard as shown by both the lab-based findings and field trials (Gabbert et al., 2009; Hope et al., 2011).

#### Forms for the Facilitation of Person Description

The pre-requisite need for person descriptions means there is a need to ensure that procedures under the control of the Criminal Justice System allow for all witnesses to provide their 'best evidence' following wither attentive or inattentive encoding. The retrieval of person descriptions especially must be fair and of use in order to prevent miscarriages of justice and to provide effective policing. The evidence of interest in the current thesis, is therefore, the person descriptions obtained with these having an undoubted impact upon the more well researched area of person identification. Although the SAI is shown to be successful in aiding the retrieval of memories its focus is not person descriptions but rather it focusses

on the narrative of the entire event inclusive of person descriptions. Disaster Victim Identification (DVI) forms used by Interpol and associated agencies internationally to facilitate the gathering of person descriptions with the collection of information typically the responsibility of family liaison officers and coordinators following mass disasters (Graham, 2006; personal communication, Marlow and Vaughn, IIRG, 2013). An issue associated with the DVI is that it consists mainly of closed and option-posing questions which are viewed as unproductive as they are associated with higher error rates than open questions and Free Recall (Griffiths and Milne, 2006).

Griffiths and Milne (2006) show that productive questions include open ended prompts such as 'tell me what happened' and 'tell me more about that'. Typically, open prompts begin with 'tell', 'explain' or 'describe' and are found to elicit accurate recall. Thus, they are viewed as productive in encouraging longer and more complete recollections to be reported without inaccuracy. In contrast, unproductive questions which limit or contaminate recall include leading or suggestive questions (see Loftus, 1979a, 1979b; Smith and Ellsworth, 1987), multiple questions (e.g. were you at the scene of the crime, who else was there? what time was it?), option posing questions (typically requiring a yes or no answer) and opinions or statements (Griffiths and Milne, 2006). The format of the DVI gives rise to a similarly closed question style.

Directive questions can also be of use. Directive questions, typically beginning with prompting words such as who, what, where, when, why and how (known as 5WH questions or probing questions), can fall into both categories of productive and unproductive question types depending on their content. Indeed, these questions can be productively used following the exhaustion of open prompts to enquire further about the details reported during open Free Recall. These questions are appropriate when they follow up a relevant response gained from open prompts and include no suggested responses. However, they can be unproductive when no associated information has previously been reported in open prompted Free Recall, or when suggestions are contained within the wording of the question (Griffiths and Milne, 2006). For example, it would be appropriate (i.e., productive) to ask, 'What length is your wife's hair?' if this information had not been provided in response to open prompts such as 'Tell me about your wife' or 'tell me more about her hair'. However, it would be inappropriate (i.e., unproductive) to ask this question had no open prompts been given previously as details



mentioned would have been suggested by the interviewer rather than being a function of witness recall thereby contaminating memory.

With the DVI being the only widely used tool specifically designed for the collection of person descriptions it is of concern that it consists mainly of closed and option posing questions associated with inaccuracy (Dornburg, and McDaniel, 2006). While due to the emotional nature of Disaster Victim Identifications social and practical support is available from Family Liaison Officers from skilled in these interviews during the collection of descriptions process and the form is highly complex in nature and is an emotionally (for example when describing a missing one) and cognitively demanding task.

Investigators aim to gain uniquely identifying details (e.g., jewellery, flaws in clothing, scars, marks, and tattoos) wherever possible to aid identification. An additional limitation of the DVI is that while it does aim to prompt such uniquely identifying details, some unique identifiers are difficult to describe fully using the DVI due to the closed question structure. Indeed, such descriptions may be crucial in the identification of an individual not only because of their uniqueness but also because these details may still be evident, visible and identifiable in circumstances whereby facial recognition may be impossible. The recall and report of any unique identifiers by next of kin may lead to a match being found and a victim identification made. Unfortunately, extraction of these details is difficult to achieve using the DVI form, because while a location on the body, colour and size of the tattoo may be noted there is less opportunity to describe the featural and aesthetic details as there is little scope for an individualised description. It is for this reason that the FIND form, a novel technique, known as the Form for INdividualised Descriptions (FIND) was developed for use in the current thesis with the aim of providing a method for the facilitation of person descriptions.

The FIND was developed for generic use regardless of exposure circumstances and for use following both inattentive or attentive exposure to persons of interest. It was also specifically designed as a self-administered alternative to the Disaster Victim Identification form (DVI) which is the only prominent contemporary method of information gathering specifically focussed on person descriptions but is highly complex with the potential for low accuracy rates which are yet untested in the literature.

This novel FIND technique draws influence from the SAI based upon the enhancement of witness memory through open prompts and facilitative techniques (Gabbert, Hope,

McGregor, Bikker, 2013). An additional aim of this form is to increase efficiency by ensuring it can function as a self-administered information gathering tool as well as having the potential to be used within verbal interviews as a protocol for the gathering of person descriptions when witnesses require social support.

The FIND form contains representation of facilitative techniques seen in the CI, ECI, MRC, and SAI. The MRC instructions are given at the beginning of the form to aid retrieval by re-engaging with cues from the encoding context as suggested by the Encoding Specificity Principle (Tulving and Thompson, 1973), and found to successfully facilitate retrieval of accurate memory (Smith and Vela, 2001). This is followed up by further open prompting regarding the appearance of the individual at the last time they had been in contact with the witness to ensure that in cases where the person being described is familiar not only a description of how the individual usually looks is gained but also a description specific to the time at which they were last seen is gained. These open prompt sections are then followed by additional non-leading prompts to provide additional cues to prompt further recall (e.g., 'please describe: clothing on the upper body, clothing on the lower body, footwear, accessories.). Further nonleading, and appropriate prompts regarding physical features of the individual are presented next (e.g., height, weight, build, hair style, hair colour, etc.). These prompts, importantly, include cues to unique identifying descriptors such as scars, marks, tattoos, and moles. It is these details that may be of most use in disaster investigations yet the DVI form allows for little description of such features.

A body outline sketch from the original DVI is presented in the FIND to aid the retrieval of information difficult to verbalise. This is one particularly useful component of the DVI as it provides retrieval support in a non-suggestive manner and so no alternate measure was deemed necessary for the FIND. Finally, the FIND probes again for unique descriptors, and in cases where the individual described is familiar to the witness requests habitual information about the individual (e.g., they tuck shoe laces into their shoes), may be valuable contributors to identification efforts. The FIND form ends with a final prompt for any additional information which can be provided.

Both the DVI and the FIND are designed to facilitate the reporting of person descriptions specifically however the DVI consists mainly of closed and option-posing questions while the FIND consists mainly of open questions and non-leading directive

prompts. This suggests that while both the FIND and MRC would increase recall for both attentive and inattentive witnesses however the DVI may increase inaccuracy in comparison to the FIND.

### Overview of the research

Given the critical importance of eyewitnesses in the criminal justice system, and an apparent lack of research relating to the topic of inattentive witnesses, the aims of the current thesis are two-fold: 1) To examine through experimental investigation the ability of inattentive witnesses to provide information about a perpetrator which is both accurate and forensically relevant and 2) to determine whether the quantity and accuracy of recalled information following poor encoding can be improved through the use of different facilitative self-report techniques.

Currently, not enough is known about the abilities of inattentive witnesses as it remains unclear how the workings of (in)attention impact upon the retrieval of unattended information within eyewitness settings. There may be variation in type, quantity or accuracy of details recalled by attentive and inattentive witnesses. Indeed, inattentive witnesses may encode similar amounts of information but require different amounts or types of support to retrieve the details of interest. To examine the ability of inattentive witnesses to provide accurate and forensically relevant person descriptions, four experimental studies were conducted.

The evidence reviewed in the current chapter shows clearly the potential for prioritisation and selective direction of attention towards a singular stimulus, as well as the potential to split attention between multiple input sources. However, much of the memory literature suggests retrieval of forensically useful inattentive memories to be possible but difficult by comparison to attentive memories. This is suggested to be due to insufficient processing during encoding through: lack of processing breadth (Anderson and Reder, 1979), processing depth (Craik and Tulving, 1975; Craik and Lockhart, 1972), binding in the episodic buffer (Baddeley, 2000) or connectedness (Tulving and Thompson, 1973). The abilities of inattentive witnesses remain untested despite the clear need for them in witness appeals such as in the Joanna Yeates case (BBC, 2011). In addition, research on memory for persons in an eyewitness context has focussed on identification procedures while less is understood

about the retrieval of person descriptions with such information generally being examined within the recall narrative as a whole.

To address the second thesis aim; to determine whether recall can be facilitated effectively following inattentive encoding, the current work investigates methods of memory facilitation with the aim of increasing the quantity and accuracy of person descriptors obtained with and without attentional focus. To control for the many multi-faceted social factors interacting to potentially alter the accuracy of information obtained in investigative interviews, and to investigate resource efficient methods of evidence gathering appropriate for inattentive witnesses, self-completion retrieval methods were used throughout the studies presented here.

The flexibility of the SAI potentially makes it the ideal tool for the collection of memories for unattended persons and events, however, as with most investigative interviewing procedures testing has included only attentive witnesses. In addition, there is a risk that a superiority effect similar to that seen in the ECI superiority effect (Griffiths and Milne, 2010) may occur whereby all components of the SAI may be viewed as beneficial on the basis of the overall outcome rather than on the contribution of each feature. For this reason, the current thesis begins, in Experiment 1, by examining the use of FR and MRC components in a self-completion manner in order to assess the appropriateness of the MRC cues in aiding inattentive witness recall as this may highlight or challenge the appropriateness of various memory models and theoretical perspectives discussed in explaining the role of attention in eyewitness settings and whether the use of a neutral prompt MRC is useful in the retrieval of inattentive memories. Specifically, it is hypothesised that the MRC may increase recall quantity but that this may decrease the accuracy of retrieval by inattentive witnesses due to the weaker memory traces and lessor ability to trigger a spreading of activation following cue overlap as suggested by (Tulving and Thompson, 1973).

In Experiment 1, the perpetrator visibly steals a bag from a victim bystander in the stimuli video. Participants are either instructed to direct their full attention towards the video stimuli or to divide attention by completing a word generation task simultaneously. Experiment 1 used a dual task paradigm to replicate divided attention during Exposure to unattended information. The experimental design aimed to replicate dual task paradigms such as the Flicker paradigm or Dichotic Listening paradigms as well as replicating witnesses

being engaged in thought or conversation requiring cognitive resources during the time of exposure to target stimuli. Such tasks have been shown to require the resources of working memory associated with language comprehension and generation thus increasing cognitive load (Brodman areas 44 and 45, and 9 and 46 respectively; Brannen, Badie, Moritz, Quigley, Meyerand, Haughton, 2001).

If the distractor task is effective, then increased cognitive load should prevent full attentional focus being allocated to the video stimuli and thus should result in impaired recall compared to attentive participants. A 2-week delay phase was also implemented to represent the delays commonly experienced by witnesses in real world investigations. A written FR task was used to gain a baseline report from witnesses while the MRC, shown to facilitate attentive witness memory, is expected to increase the amount and accuracy of information reported. The findings of Experiment 1 were limited due to floor level recall in both attentive and inattentive conditions. In addition, the manipulation check shows the distractor task did not significantly impair recall over the delay. While it would be interesting to follow experiment one up with an immediate test added, other issues may be better addressed using a paradigm similar to those used in research regarding incidental learning.

With no significant differences in the high levels of accuracy between conditions in Experiment 1 it was concluded that no observable harmful effects of the MRC cues specifically affected divided attention participants. Therefore, the use of the SAI containing the MRC component appeared appropriate. Experiment 2 therefore was designed to compare recall of memories using a FR or SAI in an immediate retrieval task following exposure to an ambiguous video clip which could either be viewed as a mock crime or everyday mundane scenes.

In addition, Experiment 2 (see Chapter 3) makes use of an alternative paradigm with a mixed methods design influenced by incidental learning experiments. In this paradigm the direction of attentional focus is manipulated rather than impaired through distraction (as in Experiment 1). Incidental Paradigms are similar to dual task paradigms in that one set of information is prioritised in contrast to a dual task paradigm where attended and unattended information is presented differently (e.g., via a different modality, visual location or audio stream (Baddeley and Andrade, 2000; Baddeley et al., 1998; Baddeley and Wilson, 2002; Cherry, 1984; Haber and Haber, 2000; Koch, 2004; Quinn and McConnell, 1996b)). In

incidental learning paradigms different stimuli appear together within one holistic presentation of material providing information for attention and dismissal via the same method and modality simultaneously. Generally, within this paradigm incidental participants are asked to attend to or engage with one sub-set of stimuli within the larger holistic perceptual representation, and their memory is then tested for information out-with the attentional instructions. Consequently, in Experiment 2 participants are either requested to view a stimulus video of a queue at a bank cash machine. Those in the attentive condition are given additional instructions stating the person second in the queue is using a stolen card.

The use of an adapted incidental learning structure here is useful in that it affords the opportunity for mock-witness participants to self-direct their attention rather than attentional resources being restricted by distractor task requirements. This satisfies the first criteria required to examine inattentive episodic memory and allows for the testing of attended and unattended information to be presented, encoded and recalled simultaneously. This also means that attentional focus can be manipulated based on knowledge or awareness of the importance of the stimuli rather than via the restriction of cognitive resources through dual-task performance.

A potential limitation of Experiment 2 is the use of target and non-target characters which were not rotated, this is corrected in experiment 3 with an additional counterbalancing measure in which the confederates rotate roles. To control for encoding opportunity across the attentive and inattentive conditions the stimuli video chosen was piloted (Valentine and McGregor, unpublished) showing persons in the video to be equally memorable, this allowed for comparisons within encoding instruction conditions. The video chosen also contained no attention-grabbing actions and depicts an everyday scene so represents everyday inattentive witness situations. In addition, inattentive participants are aware of the target information's presence but not their importance, therefore attention during exposure to the stimuli was self-directed by participants and out-with control of the researchers. This was an intentional feature of the experimental design representing the lack of control over such factors in real world experiences.

Using the novel procedure influenced by incidental paradigms but adapted for Episodic stimuli, all participants are able to self-direct visual and cognitive attention during the encoding experience, while those given experimental instructions to direct attention

based on the goal outlined centre their attention on a sub-section of stimuli. This allows an examination of inattention in both a within and between-subjects manner to determine whether attentional focus on other information or lack of attentional focus generally inhibits retrieval. Inattentive and attentive encoding is, therefore, examined through the methods used to examine incidental and intentional learning in a between-subjects manner through manipulation of the experimental instructions, and in a within-subjects manner within the attentive condition with the non-target acting as an unattended person. Experiment 2 takes on this mixed model examining inattentive and attentive encoding. Although the incidental paradigm serves the required purpose in being able to test inattentive memory, the two are not the same. The paradigm generally requires a level of engagement during the presentation of tasks that is measurable, as encoding processes are not measurable in the eyewitness context other than via retrieval. Therefore, without specialist equipment which was not available to the researcher to examine the neurological spread of activation hypothesis, it cannot be said that these memories are truly incidental (without conscious and reportable awareness). Indeed, it is not the goal of the current thesis to examine information out-with awareness, but rather that which participants are aware of but not paying deliberate attention to or making effortful attempts to store memory for future retrieval (i.e., prospective memory).

In order to examine the influence of attention on encoding and the resulting recall of inattentive and attentive participants, rather than perception, exposure and perceptual opportunity must be controlled. To control for this, participants across conditions (within experiments) were exposed to the same stimuli; persons described in recall tasks were on screen for the same length of time; and in Experiments 2 and 3 were piloted to ensure they were equally memorable.

Experiment 3 (see Chapter 4) has a similar design to Experiment 2's attentive condition with all participants receiving the attentional focus instruction and the examination of recall focussing upon descriptors for a target and non-target following this instruction. This experiment was also conducted within a live environment to better represent witness experiences with instructions being delivered by a lead or target confederate who is attended to. A secondary non-target confederate is also present but has no interaction with

participants. The FR, DVI and FIND methods of retrieval are compared to investigate how well they support the retrieval of person descriptors for attended and unattended confederates.

In Experiment 4 (see Chapter 5), participants' attentional focus is manipulated via information available from the stimuli itself rather than via instructions. To facilitate this, participants view the same video of an everyday journey through a university campus with one scene which differed. Participants encountered a poster depicting either a missing person (attentive condition) or a missing dog (inattentive condition). In the next scene of the video the missing person can be seen. Participants are asked initially to report their memories using a FR task. Following this a second report is obtained using an MRC task aiming to elicit additional information. Additional coding examining participants' ability to provide fine and coarse grain details is implemented within this final experiment to examine further the quality of information provided.

With all of the retrieval tasks used in this experiment some adaptation had to be made to ensure appropriateness for the experimental circumstances. For example, references in instructions to a familiar person in the FIND and DVI were replaced with terms referring to the experimental target while the DVI had to undergo modifications to remove inappropriate questions regarding information participants would not have access to.

All retrieval tasks included a Report Everything Instruction meaning this was added to the FR, MRC and DVI. This allows for uncertainty which may be helpful in facilitating witness reliability and controls for the effect of the Report Everything Instruction on report withhold decisions which may influence inattentive participants to withhold more than attentive witnesses (Koriat and Goldsmith, 1994, 1996; College of Policing, 2018). In addition, an MRC task (inclusive of those within the SAI and FIND) include an optional eye-closure instruction. Vredeveltdt et al. (2001) examined the use of eye-closure on fine grain and coarse grain recall. It was found that those in the eye-closure condition recalled more fine grain information whilst no increase in coarse grain information. These findings were explained as being due to participants being better able to visualise the 'to be remembered' event when eye-closure was used. The instruction is optional within the current thesis in order to maintain consistency with real world use in which eye-closure is not enforced for ethical reasons such as avoidance of discomfort or potential re-traumatisation.



A FR was also included in all experiments as a baseline measure of unfacilitated retrieval. In addition, throughout the experiments in the current thesis controls were put in place to facilitate an equal viewing opportunity with the exception of experimental manipulations of attentional focus with the aim of ensuring that differences observed are due to attentional manipulations rather than perceptual opportunity.

## Chapter 2: The Effect Of Dividing Attention And Memory Facilitation On Mock Witness Recall Of Person Descriptors.

“Memory is the greatest of artists, it effaces from your mind what is unnecessary.” (Maurice Baring)

Experiment 1 examines attentive and inattentive encoding of person descriptors using a dual task paradigm. The purpose of the current experiment was to explore the effect of dividing attention and the response of witnesses to memory facilitation techniques. Half of the participants; those in the inattentive condition, were asked to perform a secondary task, dividing their attention while viewing a bag theft video clip. Participants in the attentive condition were able to dedicate their full attention towards the video stimulus with no suggestion given as to where to focus their attention. The distractor task chosen was a word generation task in which participants were asked to generate as many words as possible beginning with a particular letter. The manipulation aimed to prevent attentional focus being directed solely towards the stimuli of interest. The experimental design aimed to replicate of dual task paradigms such as the Flicker paradigm or Dichotic Listening paradigms discussed in chapter 1 with the use of video stimuli which better represent episodic memory. The choice of a Word Generation Task replicates the witness being engaged in thought or conversation requiring cognitive resources.

Self-generated information has been found to be better recalled later than stimuli which has been presented to participants, this is known as The Generation Effect (Jacoby, 1978, 1983; Slamecka and Graf, 1978; Taconnat, and Isingrini, 2004) It is therefore suggested that and the generation of words is more cognitively demanding than exposure itself and more likely to increase the level of semantic processing required for the task. Indeed, the concept of elaboration during perception by engaging in semantic meaning is known to be useful in increasing retention of target information and forms the basis of many mnemonic strategies. This fits well with the Encoding Specificity Theory presented by (Tulving and Thompson, 1973) and is supported by improved performance when higher overlap between encoding processes and retrieval processes are engaged in through reinstatement of the encoding experience (McNamara and Healy, 1995, McNamara and Healy, 2000). Previous use

of such tasks has found increased activation of Broca's area (Brodmann areas, 44, 45; as well as Brodmann areas, 9 and 46; Brannen, Badie, Moritz, Quigley, Meyerand, Haughton, 2001).

Although Broca's area is typically associated with language comprehension and generation it has also been found to require significant resources from working memory. This is evidenced by a reduced ability to perform the task when participants are asked to simultaneously complete a finger tapping task simultaneously using a cross modal dual-task paradigm (Rogalsky, Matchin, and Hickok, 2008). In addition, later recall of words is self-generated words are better recalled than word exposed to in word pair completion tasks thus suggesting that more cognitive resources are dedicated to generation tasks than completion tasks (Taconnat, and Isingrini, 2004). These findings suggest the word generation task to be an appropriate choice for the current study to divert cognitive attention and resources away from the stimulus video without removing the possibility of encoding it by dividing visual attention in a same modality dual task paradigm.

The inclusion of the word generation task aimed to divide attention but also allows for the opportunity for a manipulation check to be employed. It was expected that a negative correlation between the number of words generated and the number of descriptors obtained at recall would show the manipulation to have disrupted attentional focus. The task was chosen as it was able to be performed while participants were exposed to the video stimuli simultaneously. Previous evidence suggests that tasks are most likely to impair memorial performance through dividing attention when they are of the same modality to the main task (Duncan, Martens, and Ward, 1997). The intention of employing a divided attention task was not to impair the perceptive opportunity to encode but to reduce the cognitive resources available during encoding for attentional processing. Word Generation Tasks have been shown to be effective in increasing cognitive load in this manner (Fu et al., 2006).

Following the divided attention task, a 2-week delay phase was imposed to replicate the delay witnesses often experience between the witnessed event and being provided an opportunity to give an account of their memories with such delays being common place within the Criminal Justice System. Following the delay phase all participants were asked to complete either a FR task or an MRC task representing component parts of the (E)CI and SAI. It remains uncertain how inattentive witnesses may respond to the FR with little in the way of memory facilitation or an MRC directing memory recall via cueing. Recollections where

compared in order to examine the amount and accuracy of person descriptors supplied about the perpetrator of the bag theft.

The current experiment makes use of FR and MRC tasks to obtain person descriptions of the perpetrator seen in the video. The FR has been shown to provide high accuracy as a baseline measure of recall in comparison to methods of questioning such as closed or directive question type (Dornburg, and McDaniel, 2006). The MRC has also been observed to produce positive results such as increased recall, increased ability to successfully create facial composite evidence and to identify targets (Davies, and Milne, 1985). The success of the MRC depends on cue consistency which may differ depending on what is attended the ability to increase the overlap between the cues available at encoding and retrieval as suggested by the Encoding Specificity Principle (Tulving and Thompson, 1973).

The WMM (Baddeley, 2000) and the encoding specificity theory (Tulving and Thompson, 1973) suggest that due to a lack of cohesion in inattentive memory the MRC may promote higher amounts of recall but is not likely to promote higher accuracy. Participants in the inattentive condition were expected to produce more information in the MRC task than in the FR task due to the use of cues with the ability for this to direct recall of information directly relevant to the cues. Inattentive participants were expected to recall less than attentive witnesses in the MRC task because attentive witnesses, having theoretically engaged in more processing within Episodic Buffer are likely to benefit from the cues present in the MRC producing more cue-overlap is likely to be present with stronger memory traces allowing for additional spreading of memory trace activation (Tulving and Thompson, 1973). The lack of binding of memories potentially associated with inattentive witnesses (Baddeley, 2000) suggests the MRC may not facilitate inattentive witness memory due to lack of cue overlap and ability for activation of memory traces to spread. Consequently, inattentive witnesses are expected to produce more information in the MRC task than in the FR task due to the use of cues with the ability for this to direct recall of information directly relevant to the cues. However, Inattentive participants were expected to recall less than attentive witnesses using the MRC, having theoretically engaged in more processing within Episodic Buffer are likely to benefit from the cues present in the MRC more so as more cue-overlap is likely to be present with stronger memory traces allowing for additional spreading of memory trace activation (Tulving and Thompson, 1973). If this is the case, then this must be

determined before testing of more cohesive facilitation techniques, such as the SAI containing both components thereby gaining an understanding of any potential for an overall superiority effect similar to that previously observed with the (E)CI (Griffiths and Milne, 2010).

The current study aims to address the following research questions a) Does dividing attention impair memory for persons over a delay? And, b) Does directed memory facilitation such as in the MRC aid the recall of person descriptions following divided attention over a reasonable delay? From these research questions five hypotheses emerged. It was predicted that the quantity of information recalled would be higher in the full attention condition when compared with the divided attention condition and that the accuracy of information recalled would be higher in the full attention condition when compared with the divided attention condition. It was further predicted that the MRC task would produce more information than the FR task and that the MRC recall task would produce less accurate information than the FR in the divided attention condition as suggested by the WMM (Baddeley, 2000) and Encoding Specificity Theory (Tulving and Thompson, 1973). The final hypothesis was that the number of words generated in the distractor task would negatively correlate with the number of person descriptors recalled, thus evidencing the manipulation of attention employed to be sufficient in disrupting attentional focus.

## Method

### Design

A 2 (encoding instruction; full attention divided attention) x 2 (retrieval condition; FR v. MRC) between-subjects design was used with dependent variables being total number of person descriptors recalled during retrieval tasks and the accuracy of this information (see coding section for accuracy criteria).

### Participants

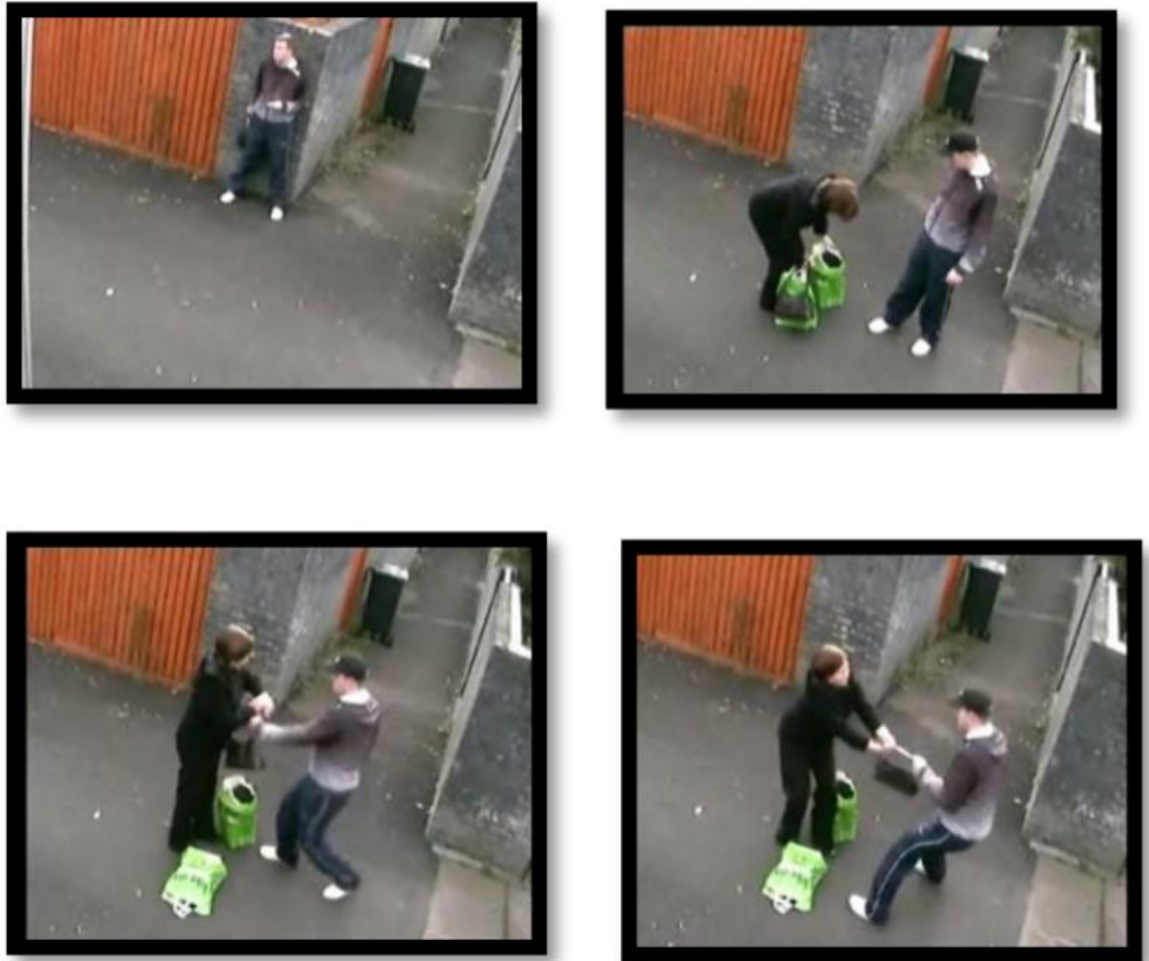
A total of 73 participants comprising 51 females and 22 males were recruited from Abertay University's staff and student population using convenience sampling. Each counterbalanced condition comprised of 18 participants. One participant was removed and replaced from the divided attention-FR condition due to no recall being available (a recall score of zero). The mean age of participants was 27.45 years old, ranging between 18 and 77

years old. Conditions were assigned randomly and were counterbalanced. Despite participants being aware of the delay an additional 16 participants did not return for the second phase of testing and their data word task and demographic data was removed.

## Materials

### *Stimulus video:*

A video was created for the purpose of the experiment. Content of the video was in adherence with a parental guidance age limitation. A non-violent video of a mock crime depicting a bag being stolen which lasted 26 seconds was shown on a 17" LCD laptop screen. The event took place on a street where a small struggle between the two characters (victim and perpetrator, see Figure 4 for video stills) occurred. The male perpetrator appears to stop the victim to ask for the time then tries to pull away her handbag. The victim dropped the bag suddenly, and the perpetrator ran out of view with the victim's bag in hand. This video was similar to the video used by Houston, Clifford, Phillips, and Memon, (2013) in an effort to examine the effect of emotion as discussed in chapter 1. Video stimuli is considered to be a more ecologically valid stimuli than those used in previous research examining inattention as this has mainly been examined within the cognitive attention literature using semantic tasks such as word list processing as this better represents a witnessed experience. The video was filmed from the vantage point of an upstairs window looking onto the street in order to provide an ecologically valid way to incorporate the framing of visual stimuli associated with would not usually be experienced in real word scenarios (i.e. The frame of the laptop screen limits the visual angles available for observation).



*Figure 4: Stills from stimulus video used in Experiment 1*

*Divided attention (Word generation) task:*

A verbal word association task was used to divide attention. This was chosen in order to disrupt participants' ability to focus resources onto the video. This was intended to increase cognitive load during video exposure. The task is similar to that used by Baddeley (1996) as a measure of Central Executive performance. Baddeley's participants were asked to list as many words as possible beginning with a specific letter while holding in memory via rehearsal a previous list using an alternative letter. The current experiment adapts this test. Rather than the dual task paradigm presented by Baddeley, we make use of the word generation task alongside simultaneous exposure to a to-be-remembered mock crime depicted in the stimulus video. This task was chosen as close attention is required to complete the word generation task successfully. A practical example using the letter 'S' was given by the experimenter, in which the words 'silver, spoon, sunshine, silhouette' were provided, and

the letter 'F' was used for the experimental task. Performance of word tasks were both observed and recorded by the experimenter. *See instructions in Appendix 1*): an important feature of this task regarding the reasoning for this choice is the verbal nature of the task allowing for disruption of attentional focus without preventing exposure to the video by drawing visual gaze away from the video. Regarding ecological validity a verbal task was chosen in order to allow for exposure to the stimuli while employing a distraction task which may be reflective of a task witnesses may be engaging in while exposed to similar situation such as conducting a conversation or being engaged in internal thought.

#### *FR task (Appendix 2)*

Recall memory has been shown to be at its most accurate when open prompts are used to gain a FR when compared to than a recall obtained through more directed means such as the use of closed questions (Schwarz,1999). Therefore, the FR instructions chosen used open prompts for information such as 'tell me what you remember about this incident'. Instructions also set clear expectations to shape witnesses' metacognitive (with awareness of one's own thought process) decisions regarding the withholding and reporting of information (Koriat and Goldsmith, 1994, 1996). By using the Instruction 'Try to be as detailed and accurate as possible, and try not to leave out any information, but please do not guess', an emphasis is placed upon both quantity and accuracy of recall and incorporates the Report Everything instruction.

#### *MRC task (Appendix 3)*

MRC instructions, adapted from MRC used previously by Dando, et al. (2009a), and Gabbert, Hope and Fisher (2009), were used to facilitate recall. The MCR instructions have been shown to aid memory recollection by helping people mentally reinstate the environmental and personal context of the witnessed event, thus generating memory cues to help access the target memory. All of the instructions present in the FR task were also present here alongside additional retrieval support such as non-leading cues (e.g. Think about what you saw, how did it start') as well as optional eye closure instructions. Eye closure has been found to be useful in aiding recall while using MRC instructions (Nash., Nash, Morris, and Smith, 2016; Vredeveldt et al., 2011, 2013, 2015).



## Procedure:

After obtaining informed consent, participants were asked to view a video of a mock crime. Those in the divided attention condition were also asked to complete a word generation task simultaneously (following a practical example by the experimenter). No such task was asked of those in the full attention group. In the word generation task, participants were given a pre-selected letter (always the letter 'F') and requested to list as many words beginning with the letter as possible. Instructions were given to divide attention equally between these two tasks. Those in the full attention condition were instructed to pay full attention to the video with no divided attention tasks. Following a 2-week delay phase, participants returned to complete a condition specific retrieval task. Participants completed either a FR task or a facilitated recall task (MRC). All participants were then fully debriefed and thanked for their participation.

## Coding

A coding system was created based on the work of Wright and Halliday (2007). The focus here was on perpetrator descriptions, action, object and setting details were only included when attributable to the target character from the stimuli video. Each correct and incorrect piece of information gained one point towards total recall score. For example, 'He used his left hand to text on a black phone' would be included with a point assigned for the recognition that the perpetrator is left handed as well as one point for the memory of a phone being used and one for the phone colour. In contrast, 'there was a brown fence' would not be included as this information relates only to the setting, would not be considered an investigatory lead and could be corroborated by a scene visit, therefore, the analysis included only 'Forensically relevant' information which may only be gained from witnesses.

Accuracy was then analysed through the proportion of the total score deemed correct and incorrect. Thus, a score of 12 details reported in total may be made up of 7 correct and 5 incorrect details rendering the accuracy score to be 58%. Any subjective responses were not coded (e.g. he looked suspicious).

All details were coded independently by two coders. Any differences in the resulting coding were discussed at a meeting of the two coders to achieve agreement. The initial

agreement was found to be 98.6%. Any items repeated were scored only once. The remaining 1.4% of details were discussed by the two coders and further details were agreed with modifications to the final coding scheme being made following these coding modifications, agreement was found to reach 99.7%. The remaining 0.3% of details were deemed too vague or unclear to be rewarded a point and were thus excluded from the coding scheme (e.g. He wore dark clothing) resulting in 100% agreement on the final coding structure. A third independent coder was requested to confirm the final agreed modifications. The maximum possible amount that could be retrieved about the perpetrator according to the finalised and agreed upon coding scheme was 12 items.

## Results

### Manipulation check

The number of words provided during the divided attention task were examined for correlation with the number of details recalled and the accuracy rate of recall within the divided attention condition. It was hypothesised that if the manipulation of attention had functioned as intended then a negative correlation between the number of words generated in the distractor task and the accuracy rate of this recall would be observed.

While the trend towards a negative relationship is suggested between the number of words generated and the number of details recalled the correlation was weak and was not found to be significant ( $r(36) = -.094, p = .585$ ). Similarly, the number of words generated did not significantly correlate with the accuracy rate of recall obtained ( $r(35) = -.159, p = .362$ ).

The mean number of words recalled during the 26 second video was 7.30 while participants in the divided attention condition recalled on average 4.39 (SD = 2.84, SE = .46) details about the perpetrator, being on average 82.25% (SD = 23.11%, SE = 3.80%) accurate in their recall. This suggests the manipulation may not have been strong enough to show differences between attentive and inattentive participants over a 2-week delay.

### Number of person descriptors recalled in Experiment 1

Total amount of person descriptors recalled in encoding (divided v. full attention) and Retrieval (FR v. MRC). The minimum amount of details recalled by participants was 0.00 and maximum was 8 of a potential 12 for the perpetrator character recall.

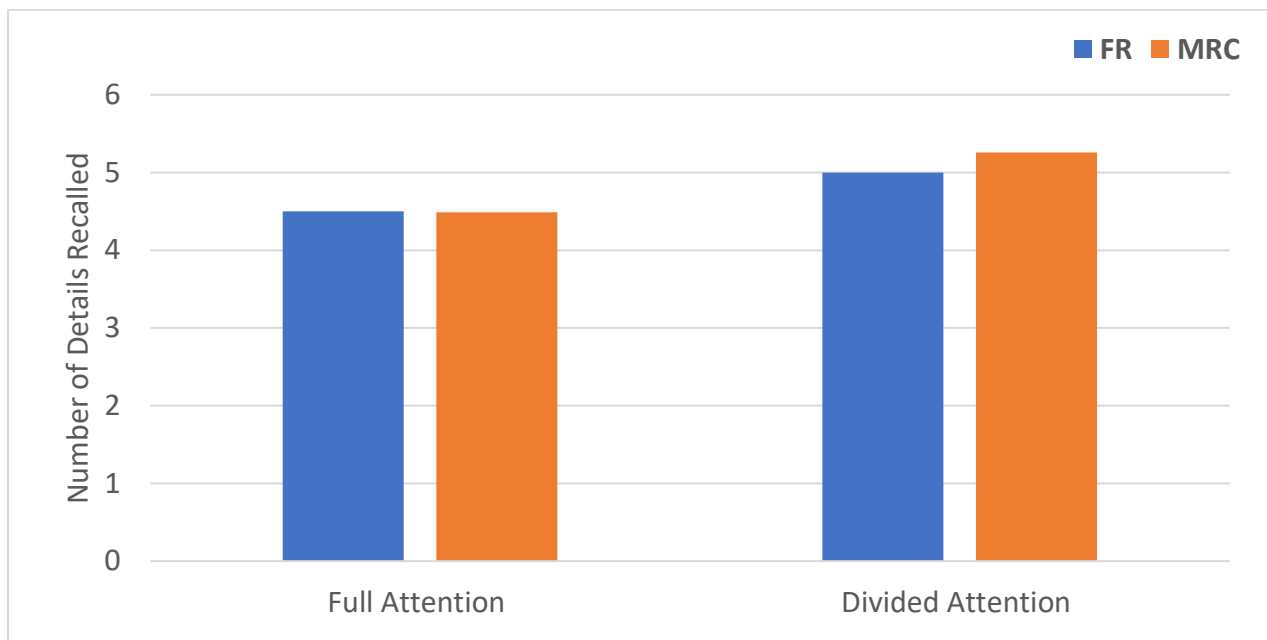


Figure 5: Mean number of details recalled in Experiment 1.

A 2 (Encoding Instruction: Divided v. Full attention) x 2 (Retrieval condition: FR v. MRC) univariate analysis of variance (ANOVA) was conducted to examine differences in mean number of person descriptors recalled.

The mean number of person descriptions in the divided attention condition was 4.39 (SD = 2.84, SE = .46), slightly less than the full attention condition which was 5.26 (SD = 2.73, SE = .44). However, the main effect of encoding condition was not significant ( $F(1, 73) = .518$ ,  $p = .474$ . Partial  $\eta^2 = .007$ , observed power = .110). Although participants recalled slightly more using the FR task (M = 5.41, SD = 2.72) than the MRC (M = 4.60, SD = 2.82), the main effect of retrieval condition was not found to be significant ( $F(1, 73) = .075$ ,  $p = .786$ . Partial  $\eta^2 = .001$ , observed power = .058). The interaction between Encoding condition and Retrieval condition was also shown to be not significant ( $F(1, 73) = .030$ ,  $p = .863$ . Partial  $\eta^2 = .000$ , observed power = .053).

#### Accuracy rates of total person descriptors recalled in Experiment 1

From the recall scores above accuracy rate was then calculated. The number of correctly recalled descriptors were divided by recall scores then multiplied by 100 to give a percentage correct which functions as an accuracy rate. The minimum accuracy rate of participant's recall was 46.15% for the perpetrator character with a maximum of 100.00%.

Figure 5 shows the means of accuracy rates of person descriptors recalled within both attention and recall conditions. One participant had a zero-recall score and was excluded from the analysis of accuracy.



Figure 6: Accuracy rates of details recalled (%) in Experiment 1.

A 2 (Encoding Instruction: Full v. Divided attention) x 2 (Retrieval condition: FR v. MRC) univariate analysis of variance (ANOVA) was conducted to examine differences in a mean accuracy rate. The main effect of encoding condition was found not to significantly affect the accuracy of perpetrator details recalled ( $F(1, 72) = 2.265$ ,  $p = .137$ , partial  $\eta^2 = .025$ , observed power = 1.000). The mean accuracy rate in the full attention condition was 91.31% (SD = 13.06, SE = 2.09%) compared to the divided attention condition which was 82.25% (SD = 23.11, SE = 3.80%).

The main effect of retrieval condition was also found not to be significant ( $F(1, 72) = .002$ ,  $p = .968$ , partial  $\eta^2 = .000$ , observed power = .261). The FR obtained 92.02% (SD = 11.78, SE = 2.51%) accuracy while the accuracy was 84.82% (SD = 21.07%, SE = 2.86%) in the MRC condition. The interaction between Encoding condition and Retrieval condition was also shown not to be significant ( $F(1, 72) = .400$ ,  $p = .529$ , partial  $\eta^2 = .003$ , observed power = .075).

## Discussion

In the current experiment, It was predicted that participants viewing the video in the full attention condition would report more information about the perpetrator and be more accurate in their recall than those in the divided attention condition. It was further predicted that the MRC recall task would produce more information than the FR task in both full and divided attention conditions while producing less accurate information in the divided attention condition based upon the WMM (Baddeley, 2000) and the Encoding Specificity Principle underlying the concept of the MRC (Tulving and Thompson, 1973; Fisher and Geiselman, 1992). These hypotheses were rejected with no significant differences in number of descriptors provided or accuracy being observed.

As participants recalled less than a half of the target information available regardless of condition the very low overall recall may have contributed to the difficulties in observing encoding and retrieval task effects. It is therefore suggested that floor level recall may have been the primary limitation due delay phase more so than experimental manipulations which may have had a more evident impact in immediate tests. This limitation is addressed in the experiments to follow with all retrieval tasks being conducted within the same experimental session as stimuli exposure.

Research suggests that divided attention should negatively impact subsequent retrieval (Lane, 2006; Sauer and Hope, 2016, Troyer and Craik, 2000; Zaragoza and Lane, 1998). With no differences being observed following delay, it seems likely that the 2-week delay phase impaired participant memory causing a floor effect in the amount of information recalled. The negative effects of delay are evident in the literature as memory traces decay rapidly and information can be lost in a short amount of time when no early retrieval opportunity is available. However, some delay may inevitable in contemporary policing with interviews requiring significant planning and preparation (Ebbinghaus, 1885; cited in Kassin, Tubb, Hosch and Memon, 2001; Gabbert, Hope and Fisher, 2009).

The high mean number of words generated within the short time available suggests that participants were engaged with the task however the manipulation check did not show the expected negative correlation between the number of words generated and the number of details recalled at test about the perpetrator. This suggests that the divided attention manipulation was not sufficient in strength to impair subsequent memory or at least that this

was not over the delay phase implemented. It is also possible that this task failed to effectively disrupt attention enough to show differences between conditions due to the modality of the task, as it involved audio-verbal processing with a lack of verbal or audio stimuli in the video. The use of unrelated stimuli for processing in the phonological Loop and Visuo-Spatial sketch-pad for these cross-modality tasks mirror the suggested processing of inattentive memories as the WMM suggests inattentive memories do not undergo processing within the Episodic Buffer (Baddeley, 2000).

Research suggests that cross-modal divided attention tasks are less effective than those in the same modality at disrupting task proficiency (e.g., Baddeley and Andrade, 2000; Baddeley et al., 1998; Baddeley and Wilson, 2002; Quinn and McConnell, 1996a, 1996b). However, the choice to use a cross-modality distraction task was based on the principle that inattentive witnesses in the divided attention condition should still be exposed to the stimuli while having attention distracted which may not have been possible if a visual distractor task was used. These findings fit with the structure of the WMM more so than the multistore model as the concept of limited processing capacity in the multistore model suggests all resources of attention to be part of the same structure while the WMM suggests separate structures are used for the processing of audio information and visual information (the Phonological Loop and Visuo-Spatial Sketch Pad respectively; Baddeley, 2001). The word task makes use of the Phonological Loop rather than sharing the Visuo-Spatial Sketch Pad's resources in the case of distractor sharing the same presentation modality as target tasks in terms of processing capacity, so despite attention being divided, these systems are not overwhelmed and can process information efficiently.

The choice of a verbal distractor task stimulus and a visual target stimulus was intended to encourage participants to make use of the Phonological Loop and Visuo-Spatial Sketch-pad without engaging in episodic processing in the Episodic Buffer. The Working Memory Model theoretically suggests that both the use of unrelated stimuli presented in a cross-modality fashion and inattention may prevent information being processed in the Episodic Buffer (Baddeley, 2000). In order to present the video in such a manner and within an ecologically valid context the scene was presented without audio from a window overlooking a street corner, from such a position the conversation between the perpetrator and the victim could not realistically be overheard. While this video is a good representation

of a real-world scenario, a scenario involving audio-verbal information may have resulted in more effective divided attention. The cross-task nature of the procedure is a good replication of the processing route unattended information may take towards long-term memory according to the WMM - ensuring information processed in the phonological loop (from the word task) is not related to that presented in the video and processed in the visuo-spatial sketch-pad. It should, therefore, not be possible for the two sources to be bound in the Episodic Buffer (Baddeley, 2000). While the Central Executive may facilitate the storage of information from sub-systems, the memory traces formed from information which has passed through episodic processing (in the Episodic Buffer) is thought to have stronger memory traces thereby aiding retrieval and replicating the suggested fate of unattended information.

These findings informed the move towards an alternative paradigm for future experiments to follow. While the divided attention task was viewed as ineffective, the paradigm may be of use if a more difficult distractor task was employed which could impair the ability to encode further or if the delay phase was significantly shorter.

As well as null effects regarding divided attention, there was a lack of difference between retrieval conditions (FR and MRC). This was unexpected due to the additional facilitation the MRC contains over the FR and which has previously been observed to facilitate memory retrieval beyond that of FR tasks (see, Memon and Köhnken (1992) for a meta-analytic review). The MRC contains non-leading cues designed to prompt memory for person descriptions over and above the facilitation provided by FR. However, while the potential lack of binding in inattentive memory (Baddeley, 2000) suggests MRC may impair accurate recall of inattentive memories, it was found that the MRC neither facilitated nor impaired accuracy in the retrieval of memories following divided attention during encoding and delay. The lack of difference in the high accuracy levels between divided and full attention participants suggests that the MRC component may not contribute significantly to an overall superiority or inferiority effect in the SAI by overshadowing other components and, therefore, suggests the use of the SAI to investigate inattentive witness memory is appropriate (Griffiths and Milne, 2010).

Another feature of the experimental design which may have contributed to low recall was the low amount of target descriptors available from the video for recall. The appearance

of persons depicted did not stand out in any manner (i.e., both the victim and perpetrator wore mostly plain clothing and the setting was common place). This may also have contributed to floor level recall. Again, these features were designed to increase ecological validity but may have limited recall to a level whereby differences due to divided attention were no longer observable. However, this was a deliberate function of the video with the decision to use plain clothing and an everyday setting being reflective of inattentive witnesses' experiences as highly memorable information may be attention grabbing inducing attention in inattentive participants.

Also, Instructions were given to divide attention equally between the two tasks used in the divided attention condition. In hindsight, it may have been more reflective of inattentive witnesses' experiences to request that the word generation task be prioritised. Experiments presented in the remainder of this thesis addressed this limitation by allowing participants in inattentive conditions to direct attention as they wished, while participants in the attentive conditions are instructed where their attention should be focussed.

A final consideration regarding the effectiveness of divided attention tasks is participant strategy. Divided attention participants may have placed extra effort on the task of remembering to compensate for the disadvantage of dividing attention (as in the effort hypothesis, Fu et al, 2006). This extra effort may then compensate for the higher cognitive load in the condition.

While it may be worthwhile to repeat the experiment without the delay phase, a paradigm shift was viewed to be a better alternative as the division of attention does not necessarily reflect inattention. A more reflective alternative may be to adapt the paradigm used in incidental learning experiments in which participants are exposed to information both included in and excluded from attentional instructions. Thus, the following experiments focus upon manipulating attentional focus by directing attentive participants towards the information of interest, while allowing inattentive participants to direct their attention naturally.

To conclude, it is evident that both the attention manipulation and retrieval tasks were not sensitive enough to observe potential recall differences in these conditions with overall recall being very low. To investigate the difference between divided and full attention alongside retrieval methods, subsequent studies address the limitations outlined above by



providing more elaborate stimuli for retrieval. These limitations are addressed by removing the delay phase and making use of more facilitative techniques in comparison with the FR task as the MRC task used may not have been supportive enough to unveil potential differences. These modifications aim to provide more opportunity for differences to be observed by providing participants sufficient opportunity for high quantities of recall. Finally, the distribution of attentional resources was manipulated using the current divided attention task while adding cognitive load was shown not to be strong enough in the manipulation check conducted. While findings did not clarify the working processes of inattentive memory, the finding that participants in all conditions could provide some useful information relevant to a potential investigation of the mock theft provides some hope that inattentive witnesses, or witnesses whose attention was divided or diverted away from target information, may still be able to provide useful information meaning that interviewing inattentive witnesses may still be of worth to investigators.

### Chapter 3: The Effect Of Attentional Focus And Memory Facilitation On Mock Witness Recall Of Person Descriptors.

“The true art of memory is the art of attention.” (Samuel Johnson)

The challenges of Experiment 1 alongside the limitation of the delay phase resulted in floor level recall and little knowledge being offered in terms of additional understanding of inattentive witnesses. However, Experiment 1 did provide further insight into the appropriateness and ecological validity of the methods chosen.

Experiment one showed no accuracy differences between the MRC and FR. While this may have been due to the delay phase limiting recall, it supports the idea that the MRC should not significantly impair accuracy to a level which may overshadow potential benefits of the SAI as a whole in the manner that the beneficial components of the CI were seen to obscure the relative ineffectiveness of others (Griffiths and Milne, 2010). The use of the SAI; containing the MRC as well as other non-leading directive cues, builds upon Experiment 1 by increasing the ecological validity of the retrieval task which is a more complete investigative method than the MRC component with added facilitative support available to witnesses in order to increase the observability.

Experiment one also revealed the delay phase to be problematic in potentially limiting recall and while a longer delay phase may provide an ecologically valid delay in terms of traditional interviewing, novel methods have been designed to lesson these delays without compromising evidence quality. Gabbert et al. (2009) find that an early self-administered recall opportunity is not only an efficient method for gaining early recollections but can also help to protect memory from the effects of delay. The success of the SAI (discussed in chapter 1) shows this to be an efficient and effective method of gathering accurate witness evidence Gabbert et al. (2009). Using self-administered methods makes it possible to allow all known witnesses the opportunity to provide recall without significant delay. The SAI contains within its components a written MRC task similar to that used in Experiment 1, thus, the choice of the SAI is an advancement upon the MRC chosen in Experiment 1 in terms of the amount of facilitative support provided. The resulting SAI submission would also provide an efficient screening tool to prioritise witnesses for future interviews. It is for these reasons the SAI has

been chosen for comparison with the FR task which produced highly accurate recall in Experiment 1 while providing no memory facilitation techniques.

The findings also provoked further thought as to the appropriateness of the divided attention paradigm. While dividing attention allows for comparisons to be made between attended and unattended information, the manipulation of attention could be critiqued as being less ecologically valid than methods which allow for a more naturalistic directing attention within one holistic stimulus as is observed in incidental learning paradigms ( Craik and Tulving, 1975; Paller, Kutas, and Mayes, 1987).

Incidental learning paradigms expose participants to sub-sets of information within one stream of stimuli. Participants engage with and make deliberate efforts to attend to and remember one set of information while making no efforts to store memories for a second (Craik and Tulving, 1975). For example, participants may be told before a word list presentation only to remember words related to living beings while ignoring words related to non-living things (Paller, Kutas, and Mayes, 1987).

The Dual task paradigm, although limited by delay also failed to impair recall with the manipulation check showing no negative correlation between performance on tasks, it may be that the distractor task was not cognitively demanding enough to impair encoding or that any effects were obscured by delay. Incidental Paradigms are similar to dual task paradigms in that one set of information can be prioritised, however, in dual task paradigms attended and unattended information is presented differently in some way be it via a different modality or visual location or audio stream (Baddeley and Andrade, 2000; Baddeley et al., 1998 and Baddeley and Wilson, 2002; Cherry, 1984; Haber and Haber, 2000; Koch, 2004; Quinn and McConnell, 1996).

The incidental paradigm provides information for attention and dismissal via the same method and modality simultaneously. Instructions allow for inattentive participants' attention to be self-directed while attentive participants attentional focus is directed without disrupting the ability to encode the stimuli. Thus, the incidental memory paradigm was used in the current experiment may better represent the experiences of witnesses than the divided attention paradigm. Attended and unattended information was presented as one holistic stimulus video. Attentional focus was either self-determined without direction via instruction

(inattentive instruction condition) or self-directed following an instruction suggesting attention should be directed in a particular manner (attentive instructions condition).

Experiment 2 examines the attentive and inattentive encoding of person descriptors within an everyday setting. Using the incidental memory paradigm, participants were exposed to an ambiguous everyday scene depicting a queue of customers taking turns to complete transactions in a bank. This stimulus video was chosen as the persons' depicted are equally memorable and not attention-grabbing (see unpublished pilot test, Valentine and McGregor, 2010). Participants were also told either before the video or after the video that the second person in the queue was using a stolen card. The second person therefore represents a perpetrator in the mock crime and is here on known as the attended target due to the intention of the attentional instructions. Participants in the attentive condition were therefore aware of the target's importance during the encoding phase while inattentive participants were unaware thus, the instruction also distinguishes between attentive and inattentive witnesses by definition of both awareness and efforts made to remember.

Participants in the attentive condition were instructed to remember the perpetrator. The purpose of the attentional instruction is two-fold; a) the attentive participants receiving the instruction are made aware that an event of interest is occurring, and that attention should be paid in an effortful manner, b) attentional focus is directed towards the attended target as a priority over the unattended target. Inattentive participants were simply asked to view the video without knowledge of the perpetrator's role or of a memory task to follow. Thus, attention in this condition is self-directed with no instructed focus of attention.

These differing experimental instructions allow the incidental learning manipulation to be used for attentional focus and intention to remember within and between attention instructions to be examined therefore attended and unattended targets as recalled by attentive and inattentive participants are examined using an 'incidental memory paradigm' within an eyewitness context.

If inattentive witnesses are able to provide accurate information using a self-completion tool such as a written FR or SAI then these witnesses may provide good corroboration evidence. While it is expected that attentive witnesses would be able to provide more information it may be that inattentive witnesses are also able to provide

forensically relevant information if given the opportunity to which is potentially key evidence if their recollections provide unique information due to their unique perspective.

The current study aimed to address the following research questions a) Does attentional focus or lack of attentional focus (manipulated via instructions) impair memory for persons? And b) Do facilitative memory techniques aid in the facilitation of recall following inattentive encoding (encoding of information without attentional focus)? It was hypothesised that; attentive participants will recall more information and be more accurate in their recollections about the target than inattentive participants. It is further predicted that attentive participants would recall less about the non-target and be less accurate in their recollections than inattentive witnesses. These expected effects are proposed to be due to more elaborate processing being engaged in for information participants are explicitly instructed to attend to with more attentional focus, than on other information present in the scene while inattentive participants' attention is diffused across the scene and self-directed. In addition, It was predicted that the SAI would obtain more information from witnesses than obtained via the FR task and that the SAI would provide more accurate information than the FR. It is therefore expected that inattentive witnesses will recall more using the SAI than when using the FR, but that performance will not reach the quantity and accuracy of recall produced by attentive witnesses. No difference in setting details recalled were predicted between attentive and inattentive witnesses as both groups were required to visually attend to the video, however it was predicted that the SAI would elicit more details due to being facilitated as part of the holistic narrative report. The expectation of the retrieval of setting details being equal between attention conditions, while memories for persons would differ, acts as a manipulation check with the attentional instructions aiming to influence attention for persons without disrupting awareness of the overall scene.

## Method

### Design

A 3 (Stimuli: attended target, unattended non-target and Setting) x 2 (Encoding instruction: attentive vs. inattentive) x 2 (Retrieval condition; FR v. SAI) Mixed design was used. The Independent variables included the attentional instruction and retrieval task while stimuli were a within-subjects variable with participants recalling details about the target,

non-target and setting details. Dependent variables included the amount of information and accuracy of recall.

## Participants

The current experiment recruited 160 participants including 93 females and 67 males were recruited from The University of Abertay Dundee staff and student population using convenience sampling. The mean age of participants was 36 years old, ranging between 18 and 54 years old. Conditions were assigned randomly and were counterbalanced. Two participants from the divided attention condition were removed from analysis and replaced due to showing continual evidence of unconscious transference throughout their report. This is a phenomenon in which bystanders or witnesses mistakenly substitute one stimulus for another, in this case a person's identity, with participants combining descriptions of the two characters recalled (Ross, Ceci, Dunning and Toglia, 1994a). This was specified as an exclusion criterion across studies to maintain consistency in condition manipulations.

## Materials

### *Stimulus video*

A short non-violent video, lasting 2 minutes and 32 seconds, of an ambiguous scenario which may be perceived as an everyday event or as a crime depicting the use of a stolen credit card dependent on encoding instructions. The video shows CCTV footage of three people queuing in a bank while waiting for their turn to speak to the bank teller. Each person processes their transactions and then leaves the bank. Participants pre-viewing instructions reflecting the ambiguity of circumstances with inattentive participants simply being asked to view the clip while attentive participants were verbally directed to attend to the perpetrator (see instructions in procedure). In the current experiment, a pilot test revealed both the target and non-target being equally memorable (Valentine, Unpublished). Content of the video was in adherence with a parental guidance age limitation. Targets are both observed in the centre of the screen opposite the bank tellers' position therefore controlling for any differences in recallability which may be related to central or peripheral presentation with both following the same entry path towards this position.



*Figure 7: Video stills from Experiment 2.*

*Attentional Instructions:*

Participants in the Attentive condition were told prior to viewing the video ‘in the video are about to see, the second person in the queue uses a stolen credit card. Your task is to remember them and provide a description of them’. Participants in the attentive condition were the told ‘Your task is to provide a description of the second person in the queue who was using a stolen credit card as well as the first person in the queue’.

Participants in the inattentive condition were told following the video ‘in the video you have just seen, the second person in the queue was using a stolen credit card. Your task is to provide a description of them as well as the first person in the queue.’

*FR task:*

The FR instructions requested participants to Report Everything they could remember about the mock crime event while attempting to be as accurate as possible and avoid guessing. The task itself was similar to that used in Experiment 1 (see Experiment 1 materials section). One important difference between the FR task used in Experiment 1 and the current study is the addition of facilitative prompts such as ‘please describe here the first person in the queue’ and ‘please describe here the first person in the queue’ (the order of retrieval was counterbalanced). This addition was simply to aid coders in clarifying the which character participants were describing and was added due to the appearance of possible unconsciousness transference effects seen in Experiment 1

### *Self-Administered Interview (SAI):*

Selected components of the Self-Administered Interview (SAI; Gabbert, Hope and Fisher, 2009) were used to facilitate recall. Specifically, the FR and MRC instructions, person descriptor cues and Report Everything instructions. The SAI has been found to be effective in facilitating accurate recall (see Gabbert, Hope and Fisher, 2009). The components which were not selected for inclusion were due to being irrelevant to the stimulus video (e.g. Vehicle description section).

### *Procedure*

All participants were provided with an information sheet and consent form. After informed consent was obtained, participants received condition-specific verbal pre-event instructions. Participants in the ‘control’ encoding condition were simply told *“Please watch the following video”*, while participants in the ‘experimental’ encoding condition were told *“The second person you see in the queue uses a stolen card. Your task is to remember as much about them as possible as you would be asked to recall details about them later.”* In this way, participants are primed to attend to a character known to be a perpetrator while not being aware of future requests to recall the non-target bystander character. All participants then viewed the video and were randomly assigned to a retrieval condition. Participants were asked to describe the first person (non-target character) in the queue, and the second person in the queue (target character). Using the instruction *“in the video you have just seen, the second person in the queue was using a stolen credit card. Your task is to provide a description of them as well as the first person in the queue, (non-target character) customer.”* This instruction was given to all participants following the video but prior to recall thus informing inattentive participants of the attended target’s importance and reminding attentive witnesses of the same. Participants either received retrieval support in the form of a partial SAI, or they received FR instructions containing little retrieval support. Participants were then thanked for their participation and fully debriefed.



## Coding

The coding scheme used was consistent with that used in Experiment 1. Ten percent of the sample was then subjected to intercoder reliability checks. All details were coded independently by two coders with 99.1% agreement. Details found to be inconsistent included descriptors being considered too vague being included (e.g. he was tall), these details were not included in the final analysis. The maximum possible amount that could be retrieved about the target and non-target according to the finalised and agreed upon coding scheme was 20 items each (the highest potential score each for the target and non-target). Setting details were also coded and compared in order to facilitate a manipulation check in which the number of setting details is expected not to differ between encoding conditions while differences in person descriptors recalled is expected to differ.

## Results

Recall scores for both the FR and SAI conditions were calculated by awarding one mark for each detail reported. The minimum amount of details recalled by participants was .00 and maximum was 13.00 (highest actual score) of the potential 20 for both the target and non-target (i.e. 20 points available per person described with a perfect recall being 40 items of correct information) Figure 3.2 shows the means and standard errors for the total number of person descriptors recalled within both the attention and recall conditions.

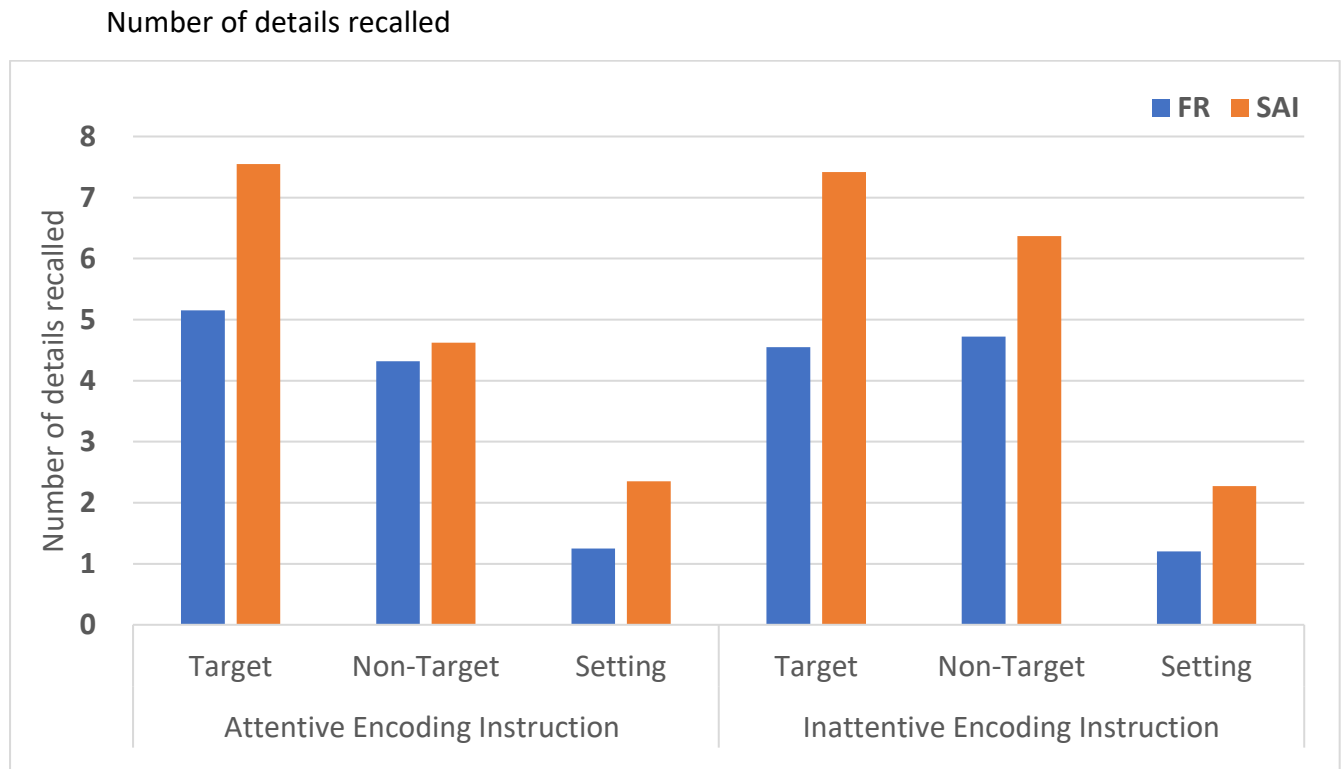


Figure 8: Mean number of details recalled in Experiment 2.

A 3 (stimuli; attended target, unattended non-target and setting) x 2 (encoding instruction; attentive v. inattentive) x 2 (retrieval condition; FR v. SAI) mixed ANOVA was conducted to examine differences in mean number of person descriptors recalled.

The main effect of the within subjects' factor, stimuli was found to be significant ( $F(2, 155) = 612.252, p < .0001$ ), with a large effects size (partial  $\eta^2 = .888$ ) and an observed power of 1.000. Participants on average recalled more information about the attended target ( $M = 6.16, SD = 2.71, SE = .21$ ) than the unattended non-target ( $M = 5.01, SD = 2.56, SE = .20$ ) and the setting ( $M = 1.77, SD = 1.16, SE = .09$ ). Pairwise comparisons showed the mean difference (1.16) between target and non-target details recalled were significant ( $SE = .29, p < .0001$ ) as was the mean difference (4.40,  $SE = .15, p < .0001$ ) between target and setting details. The mean difference between non-target and setting details recalled was 3.24 ( $SE = .22, p < .0001$ ).

The main effect of encoding instruction ( $F(1, 156) = 1.200, p = .275$ . Partial  $\eta^2 = .008$ , Observed Power = .193) was found not to be significant. However, encoding instruction was found to significantly interact with stimuli ( $F(2, 155) = 3.560, p = .031$ ). There was a small effect size (partial  $\eta^2 = .044$ ) and an observed power of .654. To follow up the significant

interaction between stimuli and encoding a Univariate ANOVA found the effect of stimuli on the amount of information recalled by attentive and inattentive witnesses to be significant ( $F(2, 158) = 543.478, p < .0001$ . Partial  $\eta^2 = .873$ , observed power = 1.000). Post hoc Bonferroni test showed that more details were recalled about the target than the non-target with a mean difference of 1.156 ( $SE = .30, p < .0001$ ). The mean difference (4.400) between target and setting was also found to be significant ( $SE = .16, p < .0001$ ) as was the mean difference (3.244) between non-target and setting ( $SE = .22, p < .0001$ ). To investigate the effects of encoding on the interaction further independent t-tests were conducted. Encoding did not significantly affect the number of details recalled about the target ( $t(158) = -.845, p < .399$ ) or setting details ( $t(158) = -.339, p = .735$ ). Encoding was seen to affect the number of non-target details recalled ( $t(158) = 2.697, p = .008$ ) with the attentive participants ( $M = 5.55, SD = 2.73, SE = .30$ ) recalling less about the non-target than inattentive participants ( $M = 4.47, SD = 2.29, SE = .25$ ).

The main effect of retrieval was found to be significant ( $F(1, 156) = 62.749, p < .0001$ ) with a small effect size (partial  $\eta^2 = .287$ ) and an observed power of 1.000. Participants in the SAI condition produced a higher mean recall ( $M = 15.30, SD = 3.98, SE = .44$ ) than those in the FR condition ( $M = 10.60, SD = 3.54, SE = .39$ ).

The interaction between Stimuli and Retrieval was also found to be significant ( $F(2, 155) = 12.972, p < .0001$ . Partial  $\eta^2 = .143$ , observed power = .997). To investigate the interaction between retrieval and stimuli further independent t-tests were conducted. Retrieval was found to significantly affect the number of details recalled about the target ( $t(158) = 7.028, p < .0001$ ), with recall being higher in the SAI ( $M = 7.49, SD = 2.57, SE = .29$ ) than the FR ( $M = 4.85, SD = 2.15, SE = .24$ ). In addition, Retrieval task was also found to significantly affect the number of non-target details recalled ( $t(158) = 2.437, p = .016$ ) with participants in the SAI condition ( $M = 5.50, SD = 2.73, SE = .31$ ) recalling more than those in the FR ( $M = 4.52, SD = 2.30, SE = .26$ ). The number of setting details recalled was also found to significantly differ ( $t(158) = 6.687, p < .0001$ ) with participants in the SAI condition ( $M = 2.31, SD = 1.11, SE = .12$ ) recalling more setting details than those in the FR ( $M = 1.22, SD = .94, SE = .10$ ).

The interaction between encoding instruction and retrieval ( $F(1, 156) = 2.301, p = .131$ . Partial  $\eta^2 = .015$ , observed Power = .326) did not significantly affect the number of

details recalled. The three-way interaction between stimuli, encoding instruction and retrieval condition was also found to be insignificant significant ( $F(2, 155) = 1.846, p = .161$ . Partial  $\eta^2 = .023$ , observed power = .380).

#### Accuracy of details recalled

From the recall scores above, the accuracy rate was then calculated. The number of correctly recalled descriptors were divided by recall scores then multiplied by 100 to give a percentage correct which functions as an accuracy rate. The minimum accuracy rate of participant's actual recall was 0.00% with a maximum of 100.00% for both the Target and non-target character. Figure 9 shows the means of accuracy rates of person descriptors recalled within both attention and recall conditions. Participants' descriptions with a zero-recall score for either the target or non-target were excluded from the analysis within that character variable.

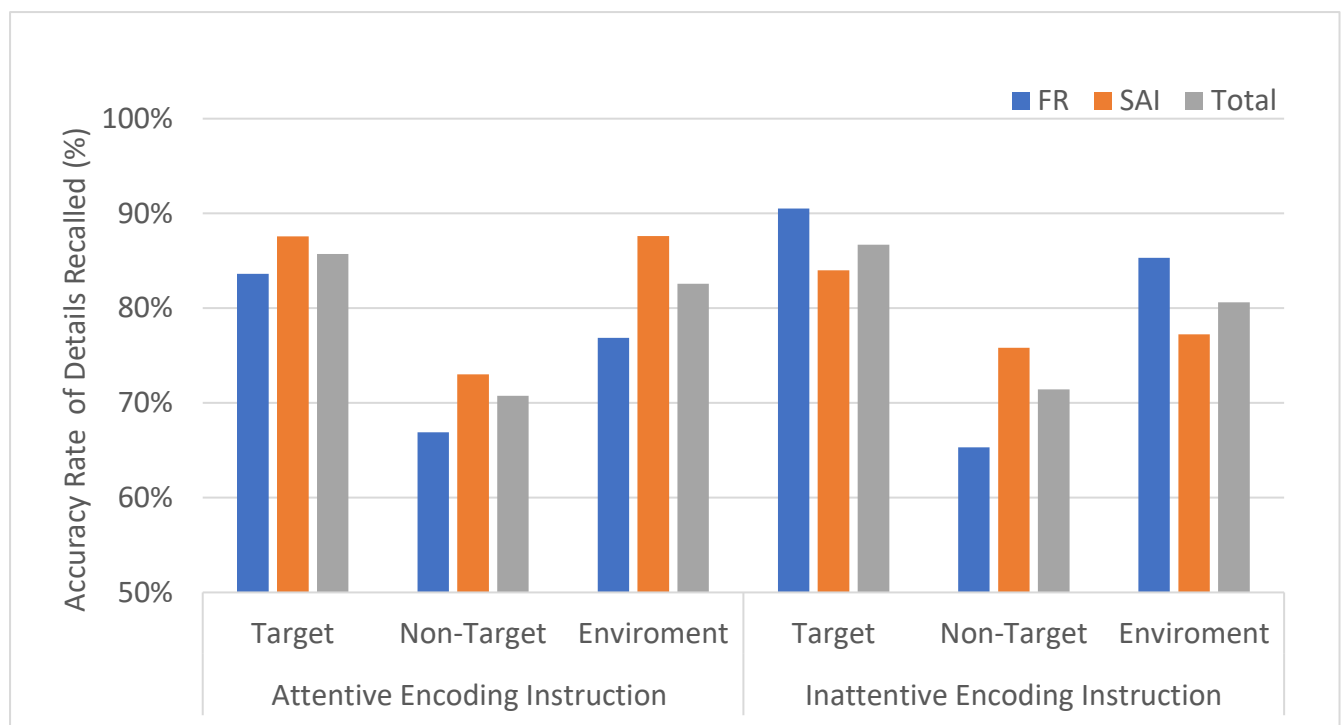


Figure 9: Accuracy rates of details recalled (%) in Experiment 2.

A 3 (stimuli; attended target, unattended non-target and setting) x 2 (encoding instruction; attentive, inattentive) x 2 (retrieval condition; FR, SAI) mixed ANOVA was conducted to examine differences in mean accuracy of person descriptors recalled.

The main effect of the within subjects' factor, stimuli was found to be significant ( $F(2, 121) = 18.006, p < .0001$ . Partial  $\eta^2 = .229$ , observed power of 1.000. Participants on average were more accurate in their recall of information provided about the attended target ( $M = 87.16, SD = 15.01, SE = 1.19$ ) than the setting ( $M = 81.58, SD = 30.42, SE = 2.65$ ) and the unattended Non-target ( $M = 69.75, SD = 27.70, SE = 2.23$ ). Pairwise comparisons showed that the mean difference in accuracy between the target and non-target details (16.17) was significant ( $SE = 2.81, p < .0001$ ) while the mean difference in accuracy between the target and setting details (4.66,  $SE = 2.26, p = .125$ ) was not significant. The mean accuracy difference between non-target details and setting details (11.50,  $SE = 3.53, p = .004$ ) was significant.

The main effect of encoding instruction ( $F(1, 122) = .020, p = .887$ . Partial  $\eta^2 = .000$ , observed Power = 1.000) was found not to be significant. The main effect of retrieval task was also insignificant ( $F(1, 122) = .820, p = .367$ . Partial  $\eta^2 = .007$ , Observed Power = .146).

The interaction between encoding and retrieval was found not to be significant ( $F(1, 122) = 1.824, p = .179$ . Partial  $\eta^2 = .015$ , Observed Power = .268). In addition, the interaction between Stimuli and encoding was found not to be significant ( $F(2, 121) = .179, p = .836$ . Partial  $\eta^2 = .003$ , observed Power = .077). The interaction between stimuli and retrieval was also insignificant ( $F(2, 121) = 1.569, p = .212$ . Partial  $\eta^2 = .025$ , observed Power = .327). The interaction between stimuli, encoding and retrieval was also found to be insignificant ( $F(1, 121) = 1.350, p = .263$ . Partial  $\eta^2 = .022$ , Observed Power = .286).

### Discussion

Experiment 2 aimed to determine whether lack of attentional focus impairs memory for persons. Findings regarding this aim were complex. The current experiment tests the retrieval potential of the SAI over FR aiming to obtain information from witnesses either instructed or not instructed to attend to a target person. The first hypothesis predicted that attentive participants would recall more information and be more accurate in their recollections about the target than inattentive participants due to attentional focus of attentive witnesses being directed towards the target. This hypothesis was rejected with no difference in memories for the target found between attentive and inattentive witnesses.

It is further predicted that attentive participants would recall less about the non-target and be less accurate in their recollections than inattentive witnesses due to the task

instructions directing attentional focus towards the target and away from the non-target. Inattentive participants were able to provide more information about the non-target than attentive participants however both attentive and inattentive participants were less accurate in their recollections about the non-target, with no evident differences in accuracy and no differences in memories for the setting. The finding that attentive witnesses recalled less about the target suggests that while attentive participants focussed their efforts on attending to and remembering information about the attended target, the attention (not perceptual focus) of inattentive participants was diffused across the scenes contents rather than focussed. In this way the attentive participant recall demonstrates similar findings to the weapon focus effect whereby memory is better for prioritised information theoretically because attentional resources are overwhelmed with the information focussed upon leading to the dismissal of non-target information with lower ability to make use of implicit processing.

As peripheral and central presentation is controlled for in the current thesis with all targets presented centrally this suggests that attentive witnesses' recall well attended targets potentially at the expense of information about others involved out-with focus such as the non-target bystander in the current experiment. This is supported by the WMM (Baddeley, 2000) as explicit focus of selective attention places strain on resources from the Phonological Loop and Visuo-Spatial Sketch-Pad. This overwhelms the components when a goal (attentive instruction) is introduced which impairs memory for information out-with these task instructions in a manner which is inattentive. This also suggests that Implicit attention enables unattended information to be processed in a resource dependent manner and that this processing may be impaired when attentional resources become centralised and are explicitly focussed, as resources for unprioritized information are reduced. Thus, a similar effect to Weapon Focus whereby the target of attention, the weapon is recalled in detail while memories for the perpetrator are lacking. In this case attentive witnesses prioritise recall of the target at the expense of the non-target. There are implications for crimes with multiple perpetrators in that attentional focus on one perpetrator may produce good evidence about the person the witness's attention was occupied with but impair recall of other persons. To control for centrality in perception both targets are presented centrally thus, effects observed are thought to be due to a centralising of attentional resources rather than perceptual

resources (visual opportunity) in response to instructions. Supporting this, participants recalled very little about the setting and this didn't appear to differ between encoding conditions. This suggests that the attentional manipulation was successful as encoding condition differences can be observed in the recall for non-target information but not for details about the setting which were peripheral to the centrally presented target and non-target.

It was further predicted that the SAI would obtain more information than the FR when used with both inattentive and attentive witnesses, this hypothesis was supported with recall being higher in the SAI than the FR for both Target and non-Target recall. The finding that the SAI increases recall overall is unsurprising and follows the prediction based on previous literature. The findings heavily support the use of the SAI given its shown ability to increase recall without negatively impacting accuracy. This is consistent with the findings of Gabbert et al. (2009) although while we see increase recall in immediate interviews, Gabbert et al. (2009) show how immediate SAI completions resulted in improved memory in delayed follow-up interviews when compared to a control group. Regarding the implications for investigating officers and the wider criminal justice community, the current and previous findings show the SAI to be a reliable, efficient and effective tool in gathering memories within the lab. This may be particularly useful when the potential role of inattention in witnesses is considered. These witnesses may not be in a position to offer evidence as frequently as the prioritised attentive witnesses, due to strained resources. The SAI offers a low resource demanding option for investigators to gain useful information from witnesses not initially considered key such as inattentive witnesses.

In-keeping with both attentive witnesses expected to and found to recall more overall and the SAI consistently outperforming the FR across attention conditions it was expected that inattentive witnesses would recall more using the SAI than when using the FR but that performance would not reach the quantity and accuracy of recall produced by attentive witnesses. With no differences in accuracy being observed across encoding and retrieval conditions and no difference in total amount recalled between encoding conditions it is concluded that participants in the inattentive condition were able to provide as much information and be as accurate in their recall as attentive participants. In addition, recall by both attentive and inattentive participants were facilitated by the use of the SAI more so than

the FR. The main differences surrounded the type of information recalled with participants in the inattentive condition spreading their attention being able to provide more details about the non-target than attentive participants. In a real-world investigation this shows that inattentive participants may be valuable and reliable witnesses able to report information that attentive witnesses, often thought of as key witnesses, may not have access to. For example, witnesses who come into close proximity to a weapon may not provide details in the periphery because their attentional and cognitive focus is placed upon the weapon. It may also be the case that perpetrators performing attention grabbing actions may direct witness's attention towards them and prevent witnesses being able to report information about others not subject to attentional focus. If additional perpetrators or other bystanders important to the case are not recalled well by attentive witnesses, then inattentive witnesses may provide crucial leads.

As discussed previously (see chapter 1), an example of the impact of non-key witness evidence produced by the SAI's impact is evident in the case study presented by Hope et al. (2011), showing the use of the SAI in a comparable real-world situation. In this case, witnesses who were not considered 'key' to the investigation (for reasons such as not viewing the initial road incident but rather viewing events from before or after the incident) were not asked for follow up interviews as the key witnesses were but instead were asked to complete a SAI. It was then found that 5 of 7 witnesses provided corroborating evidence and that all witnesses who completed the SAI provided relevant fine and coarse grain information. While it is unknown whether the witnesses in this sample were attentive or inattentive it is known that they were not initially considered 'key witnesses' but provided 'key' evidence. Police officers surveyed found the tool to be a useful contribution to cases. The SAI in the case study also identified 3 additional key witnesses. Given the success of the SAI both in the lab and in the real world with the addition of the current findings that the SAI can increase recall without increasing error in inattentive witnesses, it seems logical that future trials and future research may wish to examine this further. For example, Officers conducting trials alongside researchers could distinguish between and compare reports given by witnesses presenting as both attentive and inattentive.

In the current study, the SAI was found to increase the target characters' reported descriptors more so than it did the non-target descriptors, for both attentive and inattentive



participants. This may be due to metacognitive reasons, for example, both attentive and inattentive participants were told (or reminded in the attentive conditions case) before the retrieval phase which character was the target. Therefore, although participants in the inattentive condition may not have encoded the target with any import or priority assigned to their recall abilities, they were potentially prioritising recall for the perpetrator (target) at a post-attention stage in light of this new information. In an attempt to control for report/withhold decision differences in attention and retrieval conditions through the inclusion of the instruction to Report Everything and to avoid guessing as a shared feature between the FR and SAI allowing for beneficial effects of cognitive components to be observed while controlling report criteria.

While efforts were made to address report/withhold decision differences in attention and retrieval conditions through the inclusion of The instruction to Report Everything and to avoid guessing across tasks these decisions may have been compromised by the use of the terms 'perpetrator' and 'customer' in the instructions (post-reveal to inattentive participants). This categorisation would further prompt the prioritisation of target over non-target information. This is not considered a limitation with regards to ecological validity but rather one of experimental control as this mirrors real-world situations whereby investigators prioritise their enquiries towards key information with the aim that witnesses do the same. While the recall instructions did not differ therefore the recall opportunity was the same for each target. This suggests any increase in target over non-target information in the inattentive condition to be due to post-encoding processing. This is taken into consideration in the experiments to follow with Experiment 3 using neutral terms to enquire about targets such as 'Describe the person who spoke to you/the person who did not speak to you' rather than 'perpetrator' and 'customer' with retrieval tasks adapted to facilitate this. It may be that meta-cognitive decision making plays a role in post-encoding allocation of resources as a priority to target information over non-target information (see, Koriat and Goldsmith, 1994, 1996). In this way, participants in the inattentive condition are able to place more effort on remembering what they now know to be important despite not knowing so at the time of encoding. Future research could potentially investigate this further.

Despite no observable effect of encoding instruction directly (hypothesis 1; attentive participants would recall more information and be more accurate in their recollections about

the target than inattentive participants) inattentive participants were able to provide more information about the non-target than attentive participants with no evident differences in accuracy and no differences in memories for the setting or target this suggests the attentional instructions to have had an influence inducing inattention for the non-target in the attentive condition but has not prevented attention in inattentive participants who appear to have made use of self-directed attention across the scene recalling persons equally well. The findings have implications for the criminal justice system. For example, at the scene of a crime, witnesses who present as having not paid attention but had been present may be less likely to be chosen to be interviewed as a key witness in accordance with knowledge-based heuristics used by the police. For example, an officer's knowledge of the ADVOKATE measures of witness reliability may cause them to distrust the memory of inattentive witnesses even though this experiment has shown them to be capable information providers for investigations (Bromby and Hall, 2002). Indeed, the SAI was found to increase the quantity of information recalled. With no difference in accuracy between the FR and the SAI, this suggests that investigators can increase the quantity of information obtained with no cost to accuracy for both attentive and inattentive witnesses. This also implies that inattentive witnesses are capable of accurate recall and can provide accurate information relevant to investigations. While it remains the case that further research into the area of inattentive witness memory is required investigators continue to make use of inattentive witnesses with no specialist knowledge of how best to promote inattentive memory available to them.

#### Chapter 4: Attentive And Inattentive Encoding Within A Live Environment And Witness Recall Of Person Descriptions.

‘To observe attentively is to remember distinctly.’ Edgar Allan Poe

While Experiment 2’s strength was the high level of experimental control, Experiment 3, presented in this chapter, achieves higher ecological validity. Experiment 3 examines attentive and inattentive encoding of eyewitness memories advancing upon the paradigm used in Experiment 2 through the use of live interactions rather than video stimuli. The use of live interactive experiences is better representative of episodic memory (Dando, Bull, Ormerod, and Sandham, 2015; Meissner, Hartwig, and Russano, 2010). In addition, Experiment 3 makes use of recall tools specifically focussed upon the retrieval of Person descriptions. While the further methodological shifts discussed mean that experimental findings are less comparable to each other across the thesis, this initial exploration into the workings of inattentive memory is in part a reflection of no obvious optimal paradigm emerging from the literature. However, the within-subjects design of the exposure phase used in this study simplifies and improves the clarity of findings, while instructions are delivered in a more ecologically valid manner as attention is directed by the stimuli itself.

Participants were exposed to two confederates within a familiar setting during an interaction in which the target confederate directs attention towards themselves and away from the non-target confederate. To do this the target confederate uses a script containing experimental instructions embedded into the interaction. The purpose of the attentional instruction being delivered in a within subjects’ manner was to combine the stimuli and encoding conditions used in Experiment 2 as the effects of encoding were perhaps made unclear by the significant effect of stimuli and insignificant effect of encoding instruction. Following the short interaction with the confederate, participants were randomly assigned to a retrieval condition and recorded memories of their interactions with confederates using either a FR, DVI or FIND.

Although the SAI is shown to be successful in aiding the retrieval of memories its focus is not person descriptions. Indeed, very few techniques specifically aimed at the retrieval of person descriptions. With the current thesis being focussed on person descriptions, attention

now turns to the identification and development of facilitative tools designed for this purpose. The Disaster Victim Identification (DVI) forms used by Interpol and associated agencies internationally to facilitate the gathering of person descriptions can be seen to have the potential to impair accuracy due to the closed nature of the questions used comprising of mostly option-posing questions associated with lowered accuracy (Graham, 2006; personal communication, Marlow and Vaughn, iIRG, 2013). Thus, a novel self-administered person description tool was developed. The development of the FIND is described further in chapter 1, however, this was based upon the principles of the SAI and designed for use alongside the SAI when additional detail about persons of interest is required. The FIND is also suggested to be an alternative to the DVI although further evaluative research is required to establish the usefulness of the FIND with the potential for further development prior to real-world testing. The current experiment therefore comprises the first test of the accuracy of reports gained using either the FIND or DVI.

DVI research to date has focussed upon biological identification which the forms are often a pre-requisite to (Interpol, 2009). To optimise comparability of the FIND and DVI, both are equivalently adapted for the experiment with adjustments made to references of familiarity using neutral terms to enquire about targets such as 'Describe the person who spoke to you/the person who did not speak to you' and with the removal of prompts for information the participants would not have access to. It is important to ascertain experimentally whether these 'applied' techniques provide memory enhancement, and whether this enhancement occurs under both attentive and inattentive conditions.

Experiment three aimed to address the following research questions a) can accurate person descriptions can be gained about unattended targets and b) can this recall can be facilitated by the DVI which has a closed question structure or a FIND form which uses a open prompt structure and contains an MRC facilitated FR. The WMM suggests that memories for unattended information is more fragmented in its storage due to a lack of Episodic processing through binding in the Episodic Buffer (Baddeley, 2000). The Encoding Specificity Theory suggests these memory traces are weaker and less likely to benefit from open prompts as cues overlap resulting in a spreading of activation and additional retrieval. Instead, memories which are fragmented in nature are perhaps more likely to benefit from direct prompts. However, recall memory is at its most accurate when open prompts are used (Dornburg, and

McDaniel, 2006; Schwarz, 1999). It is, therefore, predicted that the DVI form would obtain the highest amount of information about the inattentive target, followed by the FIND form with FR obtaining the least. In contrast, it is expected that the FIND would produce more details about the attended target than the DVI, again with FR obtaining the least. It is suggested that this may be due to having a better ability to respond to MRC cues and open prompts with more cue-overlap and stronger memory traces (Tulving and Thompson, 1973). It is also predicted that attentive participants would recall more information and be more accurate than inattentive participants across recall task conditions. Setting details are expected to be recalled at higher rates in the FIND condition compared to the DVI and FR conditions as the MRC component of the FIND may allow for cue overlap to facilitate recall of setting details alongside person descriptions in a narrative format.

#### Pilot experiment

The main experiment reported here required the use of two confederates of the experimenter. In order to maintain some control over the memorability of targets a pilot test was conducted to ensure all of the confederates chosen to represent Target and Non-Target individuals were approximately equally memorable. Four potential confederates were recruited and pilot participants' memories for confederates tested. Importantly, this aimed to a) prevent attentional switching towards the non-target if they were overly distinctive and b) prevent baseline differences in memorability of targets and non-targets presenting as differences related to attention. To further control for this, confederates counterbalanced the roles they performed.

**Participants:** Ten administrative staff members of Abertay University participated in the pilot study. Participants were all female with an average age 37.6 (ranging from 20 to 54 years).

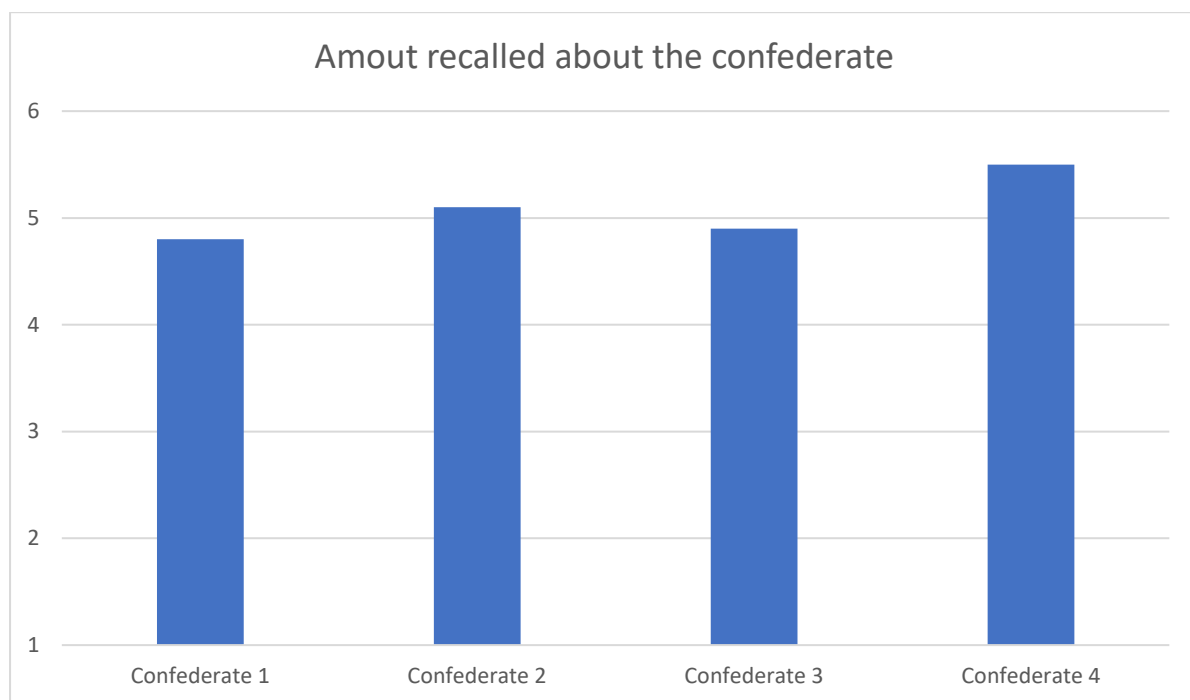
**Materials:** Four photographs were printed in A4 colour depicting the head, shoulders and upper torso of each confederate. Confederates were all female students in their early 20's (ranging from 20 – 24 years old). Confederates were also instructed to wear plain clothing for the photographs.

**Procedure:** Participants were asked to view the confederate images for one minute (photographs depicting a research assistant) then provide FR person descriptions for each. As

can be seen from Figure 10 below the number of descriptors recalled was consistent, with Target four being slightly more memorable than the others.

### Pilot Results and discussion

The mean recall score for each target was calculated manually by dividing the sum of reported descriptors by the number of descriptors reported. This showed that targets 1,2 and 3 were recalled consistently, with a larger difference between recall for target 4 and others (Figure 10). For this reason, target 4 was excluded and acted as the experimental recruiter while the remaining confederates took on the target and non-target roles in a counterbalanced order.



*Figure 10: Mean pilot test recall for Experiment 3.*

With baseline memorability controls in place, any differences in the main experimental data are more likely to be due to experimental manipulations than character memorability differences. Thus, these pilot study findings suggest the exclusion of Target four from the pool of confederates being counterbalanced is justified. Although the amount recalled about each Target was relatively low, this is not an issue as no facilitative techniques were used in the pilot study and baseline memories would be expected to be low. Also, the photographs used as a proxy material here do not contain as much information as would be

available in the main experiment's live scenario, as photographs show only the upper half of the body from a singular viewpoint. This was considered when confederate dress codes were developed for testing days (see the main experiment method for more information).

### Main Experiment

Experiment 3 examines the reliability of eyewitness memory following a live interaction. Memory for person descriptors is measured using FR (FR), the widely used Disaster Victim Identification Form (DVI), and a novel technique known as the Form for Individualized Descriptions (FIND). Following the findings of Experiment 2, all participants were required to provide attentive and inattentive recall by being asked about two confederates with whom they had been seated. One of those confederates was encoded under attentional witness conditions – the participant knew they would subsequently be asked about this main Target. The other confederate was encoded under inattentive witness conditions – the participant was not instructed to remember any details of this Secondary Target. It was hypothesised that differences in quantity and accuracy of information provided about these Targets would differ between Targets and across retrieval conditions. Differences were expected between recall of Target and Non-Target characters and between recall conditions regarding the quantity and accuracy of information recalled. Specifically, it was hypothesised that recall for the Target confederate would be higher in quantity and accuracy than the Non-Target. It was also predicted that differences in recall between the FR, FIND and DVI would be evident in that the DVI and FIND were both expected to outperform the FR in terms of quantity of information recalled while accuracy was expected to be better in FIND reports compared to the DVI.

### Method

#### Participants and design:

A convenience sampling method was used to recruit 72 participants; 19 males and 53 females with a mean age of 22.32 (SD= 5.86, range = 17-50) from the staff and student population of Abertay University. Participants were allocated randomly to experimental conditions. A 2 (Character: Target, Non-Target) x 2 (retrieval condition: FR, DVI, FIND). A mixed

design was used with Target being a within-subjects factor and retrieval condition being a between-subjects factor.

## Materials

### ***Confederate script:***

A script was developed to ensure the lead confederate delivered the same instructions to all participants during the encoding phase of the experiment. This can be viewed below in the procedure section.

### ***FR task:***

The FR instructions requested participants to Report Everything they could remember about the mock crime event while attempting to be as accurate as possible and avoid guessing. The FR used was conceptually similar to those in experiments 1 and 2 with wording adaptations to suit the scenario and the removal of the non-leading cues used in Experiment 2 in exchange for more task relevant prompts such as ‘please describe here the person who did speak to you’ and ‘please describe here the person who did not speak to you’.

### ***Form for Individualised Descriptions (FIND):***

A new ‘person descriptions interview’ form created by Gabbert, Hope, McGregor, Bicker (in prep) was used to facilitate recall. This paper based, self-administered interview focussed on reinstating the last memory of the person the witness is attempting to describe and provides non-leading cues to aid the memory. The interview booklet also contains sections focussed specifically on retrieving information which would be considered forensically relevant and uniquely identifying.

### ***Adapted (Ante-mortem) Disaster Victim Identification forms (DVI):***

The Ante-mortem Disaster Victim Identification Form was adapted for use in the current study. When adapting the DVI, prompts considered irrelevant to the current study regarding dental and medical records as well as any questions regarding information unavailable to the witness participants such as those of a personal nature were removed. The form was also simplified by altering the layout to be more reader friendly. Importantly the prompts and question styles remained the same and differences between the trial form used



here and the original were minimal. A copy of the original AM-DVI is retrievable from the Interpol website (<https://www.interpol.int/INTERPOL-expertise/Forensics/DVI>) alongside the guidebook cited in the references (Interpol, 2009) while the version adapted for the current study can viewed in the appendices.

### Procedure

Potential participants were approached in 'social areas' within the Abertay University campus by an experimenter who provided some information about the experiment and invited people to take part. This allowed them time to read and consider the information and consent forms. Following consent being granted, those who did wish to take part were escorted to a nearby seating area in another location under the premise that the lead researcher would give them more information. They were then asked to take a chair and join two confederate participants who were already seated opposite the participant's location. At this stage, participants were still unaware that the experiment had begun. The experimenter then told the participant that they would now introduce them to a colleague who would provide them with more information about the experiment. One of the seated confederates (subsequently referred to as the Main Target) then slowly addressed the participant with the following script;

*"As you know, we are interested in investigating the reliability of eyewitness memory over a delay. Your role as a participant is to remember as much about me as possible, for example, what I look like and what I am wearing. Start paying attention now. When you return for the final part of the study, you will be asked to provide a description of me. The experimenter will code the amount and accuracy of the information that you are able to recall at that time. We are running the study in this way to examine how good people are at being able to provide reliable descriptions of people that they have only interacted with for a short time. Take one last good look because your time is up now!"*

The confederate sitting next to the main Target was never introduced to the participant, nor did they interact with the participant, experimenter, or the main Target at all. This confederate is subsequently referred to as the Secondary Target. Confederates alternated their role as the Main Target or Secondary Target. The Recruiter then accompanied the participant to a second testing area where the main Target and Secondary Target were

out of view. For the test phase of the experiment, participants were presented with information, explaining that they would be asked to describe both the Main Target (attended Target) and the Secondary Target (non-attended Target). The order of Target recall was counterbalanced across participants to increase control over any potential memorability differences between confederates. Participants were equally split between recall conditions (24 to each) and then a written recall test in the form of an equivalently adapted FR, DVI or a FIND, depending on which experimental condition they had been assigned to. Participants were fully debriefed, thanked for their participation and invited to ask questions.

### Coding

The coding scheme used was consistent with that used in Experiments 1 and 2 in the scoring of person and setting details, however the live scenario used presented new challenges regarding maintenance of stimuli consistency. In order to control for this a more in-depth coding scheme was developed alongside an agreed upon consistent dress code for testing sessions. In advance of data collection, a coding list of correct descriptors was developed through a laboratory based confederate description exercise. Each confederate ( $n=3$ ) described both themselves and other confederates using a DVI form. These descriptions did not rely upon memory as confederates were present during the process and photographs of each item included were available (e.g. whole-body photos, facial photos, and photos of individual items such as shoes and jewellery). Following these descriptions being collected, each descriptor was discussed with those being provided by at least 2 of the 3 confederates being included within the initial correct descriptor list. Details were included as correct descriptors in the list only when an equivalent detail was available for all confederates. Therefore, if one confederate had an additional facial feature with no reportable equivalent then this was not included. This was relevant only to one detail as one confederate was frequently reported to have freckles while other confederates did not receive facial descriptors of this nature. In addition, following the collection of data the correct descriptor list was re-visited. Details were then added or removed from the list based upon appearance of details in participant recall. Specifically, details only provided using one retrieval method or which were recalled by 0 participants were excluded (e.g. jewellery descriptors and hair accessories) while details described by at least one participant in each retrieval condition

were added. For each item recalled by participants accurately a point towards a correct recall score was given while any details mentioned in contradiction to this as well as details which were not present (confabulation) contributed one point to an incorrect recall score. These scores were then used to calculate total recall and accuracy rate. In addition, where details are removed and added from one confederate description code the equivalent or matched detail was also removed from the list for other confederates. For example, as no participants described the finger ring worn by confederate 1 this detail was removed alongside the bracelet worn by confederate 2 and hair bobbles worn on wrist by confederate 3, ensuring the same number of descriptors were available for all confederates. The inclusion of descriptors only when reported at least once in each of the three retrieval conditions also allowed for recall to be comparable across conditions. In addition, temporary descriptors such as 'adult acne' were not coded as these were not considered to be consistent across data collection sessions taking place over 8 days over a 4-month period. The modifications to the coding scheme were put in place in order to maintain consistency of stimuli presentation and reportable outcomes allowing for the standardised use of a live scenario and techniques to be fairly compared. The maximum possible amount that could be retrieved about the confederates according to the finalised and agreed upon coding scheme was 28 items per Target (therefore totalling 56 items) with an additional 10 setting details available for retrieval.

### Results

Recall scores for the FR, DVI and FIND conditions were calculated by awarding one mark for each detail reported. The minimum amount of person description details recalled by participants about the main Target was 10 with a maximum of 24. The minimum amount of person descriptors recalled about the Secondary Target was 0 with a maximum of 27 (total recall maximum being 37). Figure 11 shows the means and standard errors for a total number of person descriptors recalled within both attention and recall conditions.

### Total amount of person descriptors recalled

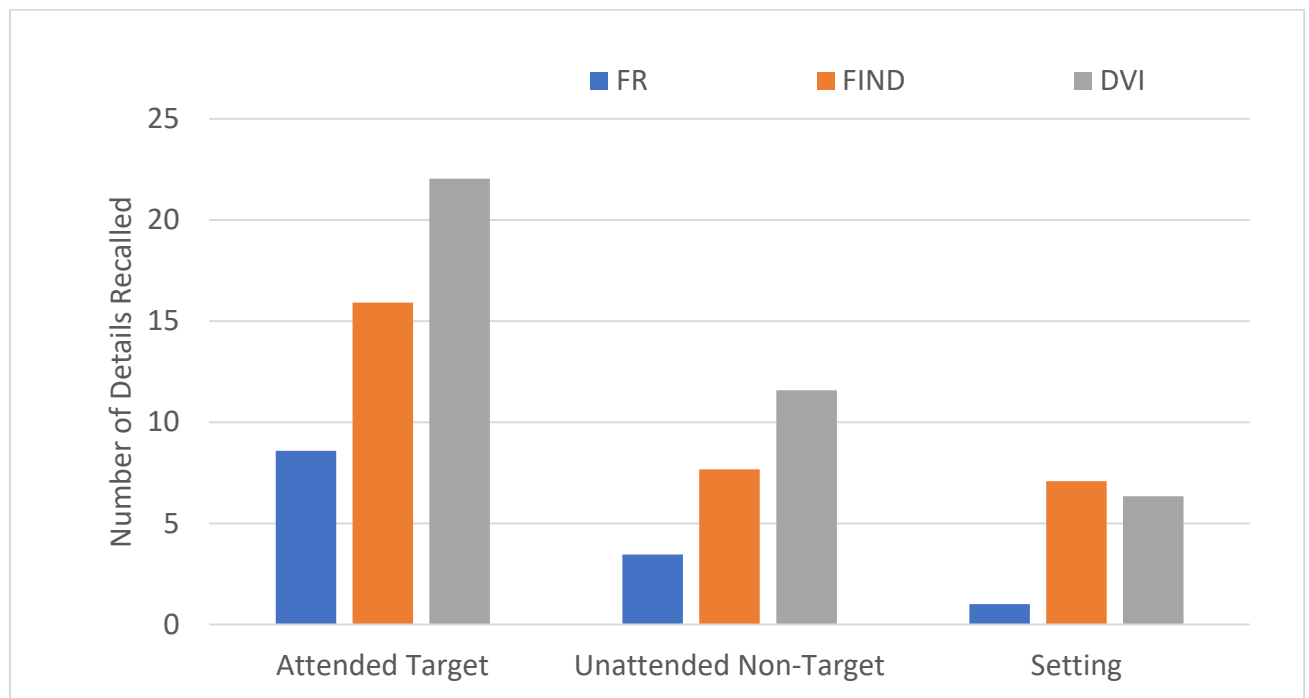


Figure 11: Mean number of details recalled in Experiment 3.

A 3 (stimuli: attended target, unattended non-target, setting) x 3 (retrieval condition: FR, DVI, FIND) mixed analysis of variance was conducted to examine differences in mean number of person descriptors recalled. The within subjects' factor, stimuli were found to be significant ( $F(2,68) = 242.692$ ,  $p < .0001$ ), with a high effect size (Partial  $\eta^2 = .887$ ) and an observed power of 1.000. Participants tended to recall more about the target ( $M = 15.50$ ,  $SD = 7.32$ ,  $SE = .86$ ) than the non-target confederate ( $M = 7.57$ ,  $SD = 6.22$ ,  $SE = .73$ ) or the setting ( $M = 4.80$ ,  $SD = 3.56$ ,  $SE = .42$ ). Follow up Bonferroni post hoc testing was conducted to further examine the differences between the stimuli conditions. The mean difference between target and non-target details recalled was 7.93 ( $SE = .774$ ,  $p < .0001$ ) while the mean difference between target and setting was 10.69 ( $SE = .518$ ,  $p < .0001$ ). The mean difference between non-target and setting details recalled was 2.764 ( $SE = .512$ ,  $p < .0001$ ).

The between subjects' main effect of retrieval condition was also shown to be significant ( $F(2,69) = 50.200$ ,  $p < .0001$ ) with a medium effect size (partial  $\eta^2 = .593$ ) and an observed power of 1.000. The DVI facilitated the highest level of recall ( $M = 39.95$ ,  $SD = 12.93$ ,  $SE = .264$ ) obtained, followed by the FIND ( $M = 30.67$ ,  $SD = 8.86$ ,  $SE = 1.80$ ) with the FR gaining the lowest amount of person descriptors overall ( $M = 13.00$ ,  $SD = 4.83$ ,  $SE = .98$ ). Follow up Bonferroni post hoc testing was conducted to further examine the differences between the

retrieval conditions. The mean difference between the FR and FIND was 5.89 ( $SE = .91$ ,  $p < .0001$ ). The mean difference between the FR and DVI was 8.996 ( $SE = .91$ ,  $p < .0001$ ). The mean difference between the DVI and FIND was 3.10 ( $SE = .91$ ,  $p = .003$ ).

The interaction between stimuli and retrieval condition was also significant ( $F(4,138) = 12.405$ ,  $p < .0001$ ) with a small effect size (partial  $\eta^2 = .264$ ) and an observed power of 1.000. To examine the differences between stimuli conditions a follow up univariate ANOVA was conducted. Stimuli was found to have a significant effect ( $F(2,70) = 131.717$ ,  $p < .0001$ , Partial  $\eta^2 = .790$ , observed power = 1.000). The mean difference between target and non-target details recalled was significant ( $MD = 7.93$ ,  $SE = .81$ ,  $p < .0001$ ) as was the difference between details recalled about the target and the setting ( $MD = 10.69$ ,  $SE = .66$ ,  $p < .0001$ ). The mean difference between non-target and setting details recalled was also significant ( $MD = 2.76$ ,  $SE = .55$ ,  $p < .0001$ ).

To further break down the interaction three additional univariate ANOVA's were conducted to examine the effect of stimuli conditions. The main effect of stimuli ( $F(2,22) = 99.134$ ,  $p < .0001$ , Partial  $\eta^2 = .900$ , observed power = 1.000) was found to have a significant effect of retrieval within the FR task. Participants in the FR condition recalled more about the attended target ( $M = 8.54$ ,  $SD = 2.76$ ,  $SE = .56$ ) than they did about the unattended non-target ( $M = 3.46$ ,  $SD = 2.26$ ,  $SE = .46$ ) and the setting ( $M = 1.00$ ,  $SD = 1.41$ ,  $SE = .29$ ). Within the FR condition pairwise comparisons found significant differences between target and non-target details ( $MD = 5.08$ ,  $SE = .56$ ,  $p < .0001$ ), target and setting details ( $MD = 7.54$ ,  $SE = .53$ ,  $p < .0001$ ) and non-target and setting details ( $MD = 2.46$ ,  $SE = .53$ ,  $p < .0001$ ).

Stimuli had significant effects on retrieval within the FIND task ( $F(2,22) = 58.621$ ,  $p < .0001$ , Partial  $\eta^2 = .842$ , observed power = 1.000). Participants recalled more target details ( $M = 15.92$ ,  $SD = 4.17$ ,  $SE = .85$ ) than non-target details ( $M = 7.67$ ,  $SD = 4.75$ ,  $SE = .97$ ) and details about the setting ( $M = 7.08$ ,  $SD = 2.57$ ,  $SE = .52$ ). Within the FIND condition pairwise comparisons found significant differences between target and non-target details ( $MD = 8.25$ ,  $SE = .1.13$ ,  $p < .0001$ ), target and setting details ( $MD = 8.833$ ,  $SE = .80$ ,  $p < .0001$ ) however there was no significant difference observed between non-target and setting details ( $MD = .58$ ,  $SE = .800$ ,  $p < 1.000$ ).

Finally, stimuli were found to effect recall within the DVI condition  $F(2, 22) = 113.273$ ,  $p < .0001$ , Partial  $\eta^2 = .911$ , observed power = 1.000) Participants recalled more target details

( $M = 22.04$ ,  $SD = 6.69$ ,  $SE = 1.37$ ) than non-target details ( $M = 11.58$ ,  $SD = 7.57$ ,  $SE = 1.54$ ) and details about the setting ( $M = 6.33$ ,  $SD = 2.74$ ,  $SE = .56$ ). Pairwise comparisons showed significant mean differences between target and non-target details ( $MD = 10.45$ ,  $SE = 1.95$ ,  $p < .0001$ ), as well as target and setting details ( $MD = 15.71$ ,  $SE = 1.22$ ,  $p < .0001$ ) and non-target and setting details ( $MD = 5.25$ ,  $SE = 1.20$ ,  $p = .001$ ).

To further break down the interaction three additional univariate ANOVA's were conducted to examine the effect of retrieval conditions. The main effect of retrieval was found to significantly affect the recall of target details ( $F(2,69) = 47.093$ ,  $p < .0001$ , partial  $\eta^2 = .577$ , observed power = 1.000) with the DVI ( $M = 22.04$ ,  $SD = 6.69$ ,  $SE = 1.37$ ) obtaining more information than FIND ( $M = 15.92$ ,  $SD = 4.17$ ,  $SE = .85$ ) and the FR ( $M = 8.54$ ,  $SD = 2.76$ ,  $SE = .56$ ). Pairwise comparisons of target details recalled showed that the mean difference between the FR and FIND conditions was 7.37 ( $SE = 1.39$ ,  $p < .0001$ ) while the mean difference between the FR and DVI conditions was 13.50 ( $SE = 1.39$ ,  $p < .0001$ ) and the mean difference between the FIND and DVI was 6.12 ( $SE = 1.39$ ,  $p < .0001$ ).

Similarly, retrieval was found to significantly affect the recall of non-target details ( $F(2,69) = 13.985$ ,  $p < .0001$ , partial  $\eta^2 = .288$ , observed power = .998) with the DVI ( $M = 11.58$ ,  $SD = 7.57$ ,  $SE = 1.54$ ) obtaining more information than the FIND ( $M = 7.67$ ,  $SD = 4.75$ ,  $SE = .97$ ) and the FR ( $M = 3.46$ ,  $SD = 2.26$ ,  $SE = .46$ ). Pairwise comparisons for non-target details showed significant differences between all retrieval conditions with the mean difference between the FR and FIND being 4.21 ( $SE = 1.53$ ,  $p = .024$ ) and the mean difference between the FR and DVI being 8.12 ( $SE = 1.53$ ,  $p < .0001$ ). The mean difference between the FIND and DVI was 3.92 ( $SE = 1.53$ ,  $p = .039$ ).

Finally, the recall of setting details was found to be significantly affected by recall task ( $F(2,69) = 49.088$ ,  $p < .0001$ , Partial  $\eta^2 = .578$ , observed power = 1.000) with the FIND ( $M = 7.08$ ,  $SD = 2.57$ ,  $SE = .52$ ) obtaining more information than the DVI ( $M = 6.33$ ,  $SD = 2.74$ ,  $SE = .56$ ) and the FR ( $M = 1.00$ ,  $SD = 1.41$ ,  $SE = .29$ ). Pairwise comparisons for setting details showed the mean difference between the FR and FIND was 6.08 ( $SE = .67$ ,  $p < .0001$ ) while the mean difference between the FR and DVI was 5.33 ( $SE = .67$ ,  $p < .0001$ ) and the mean difference between the DVI and FIND was .75 ( $SE = .67$ ,  $p = .800$ ).

### Accuracy rates of total person descriptors recalled

From the recall scores above, the accuracy rate was then calculated. The number of correctly recalled descriptors were divided by recall scores then multiplied by 100 to give a percentage correct which functions as an accuracy rate. The minimum accuracy rate of participant's recall of the Target was 56.00% with a maximum of 100.00% while the minimum accuracy of the Non-Target confederate was 0.00% with a maximum of 100.00%. Figure 12 shows the mean and standard errors of accuracy rates of person descriptors recalled within both attention and recall conditions.

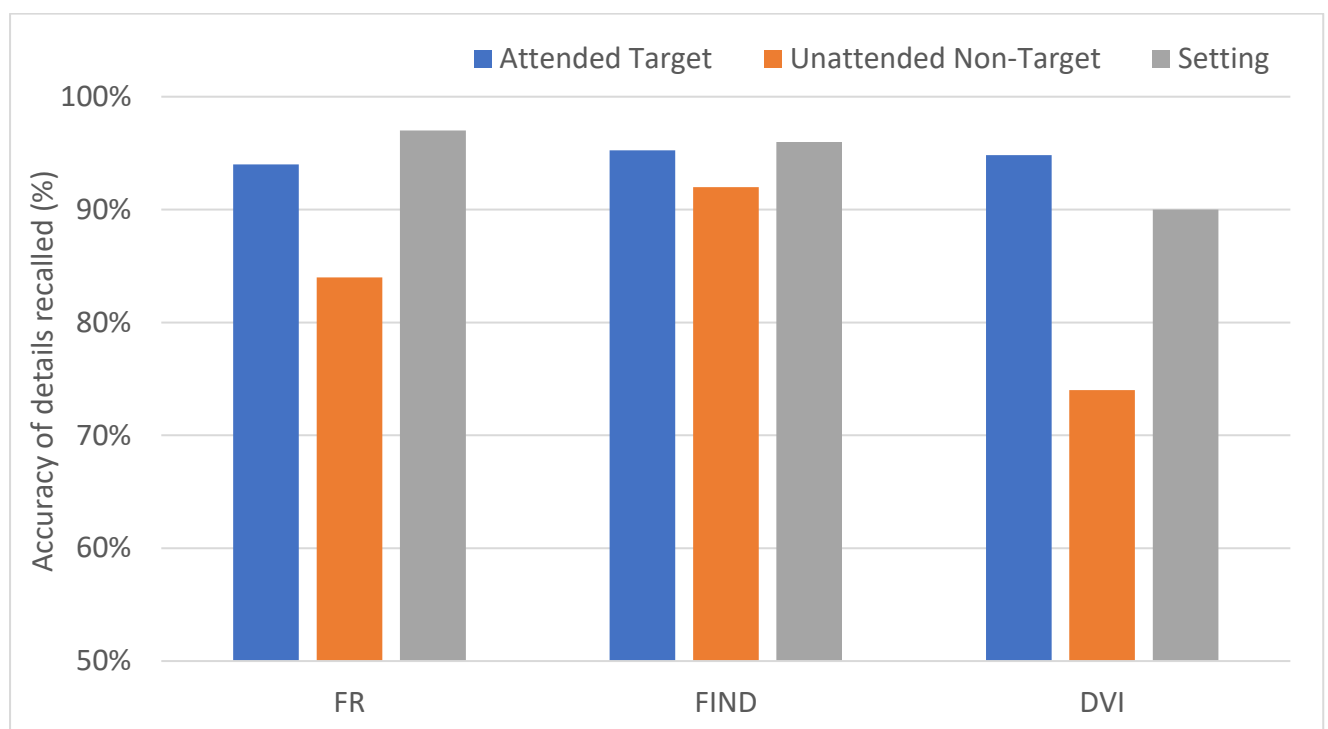


Figure 12: Accuracy rates of details recalled (%) in Experiment 3.

A 3 (stimuli: attended target, unattended non-target, setting) x 3 (retrieval condition: FR, DVI, FIND) mixed analysis of variance was conducted to examine differences in mean accuracy of person descriptors recalled. The within subjects' factor, stimuli were not found to be significant ( $F(2,54) = 2.179$ ,  $p = .123$ . Partial  $\eta^2 = .075$ ) and an observed power of .427. The mean accuracy rate of Target descriptions was 94.65% ( $SD = 10.68$ ,  $SE = 2.18$ ) compared to 84.40% ( $SD = 28.79$ ,  $SE = 6.28$ ) for the Non-Target person descriptions and 97.22% ( $SD = 9.62$ ,  $SE = 2.77$ ) for Setting descriptors.

The between-subject main effect of retrieval condition was significant ( $F(2,55) = 3.396$ ,  $p = .041$ . Partial  $\eta^2 = .110$ .  $OP = .616$ . The DVI obtained 86.30% ( $SD = 15.17$ ,  $SE = 3.09$ )

accuracy while the accuracy was 95.14% (SD = 10.63, SE= 3.36) in the FR condition and 94.45% (SD = 8.50, SE= 1.73) in the FIND condition. Pairwise comparisons found the mean difference (.692) between the FR and the FIND not to be significant (SE = 4.531,  $p = 1.000$ ) while the mean difference (8.839) between the FR and the DVI (SE = 4.531,  $p = .169$ ) as was the difference (8.147) between the DVI and the FIND (SE = 3.475,  $p = .068$ ).

The interaction between stimuli condition and retrieval condition was also significant ( $F(4, 110) = 2.889$ ,  $p = .026$ . Partial  $\eta^2 = .095$ , observed power = .765). The interaction was broken down by conducting 3 follow up univariate ANOVA's investigating the effect of retrieval. Retrieval differences between target details were not found to be significant ( $F(2,69) = .165$ ,  $p = .848$ . Partial  $\eta^2 = .005$ , observed power = .075) as was differences in non-target details ( $F(2,66) = 2.476$ ,  $p = .092$ . Partial  $\eta^2 = .070$ , observed power = .481) and setting details ( $F(2,57) = 2.637$ ,  $p < .080$ . Partial  $\eta^2 = .085$ , observed power = .504)

A further 3 univariate ANOVA's were conducted examining the effects of stimuli within retrieval conditions. Within the FR condition, stimuli were not significant ( $F(2, 8) = 2.076$ ,  $p = .118$ . Partial  $\eta^2 = .342$ , OP = .308). Stimuli was also insignificant within the FIND condition ( $F(2, 22) = 1.272$ ,  $p = .300$ . Partial  $\eta^2 = .104$ , observed power = .247) However, there was a significant effect of stimuli within the DVI condition ( $F(2, 22) = 4.419$ ,  $p = .024$ . Partial  $\eta^2 = .287$ , observed power = .700. Pairwise comparisons within the DVI condition show that the mean difference between target and non-target recall accuracy was 20.54 (SE = 7.22,  $p = .028$ ) while the mean difference (5.003) between target and setting details was not significant (SE = 2.376,  $p = .139$ ). The mean difference between non-target and setting details was 15.537, however this was found to be insignificant (SE = 6.667,  $p = .087$ ).

### Discussion

The hypothesis that participants would recall more about the target confederate than the non-target confederate was supported, while the hypothesis that memories would be more accurate for the target confederate was rejected with accuracy rates being similar for both confederates. It was further predicted that The DVI would obtain more information than the FIND about the unattended target and that these would both obtain more information than the FR. This was found to be the case for memories of both attended targets and unattended non-targets therefore, the hypothesis that the FIND would produce more details



about the attended target than the DVI, was rejected. The FR, chosen to provide a baseline measure of unfacilitated retrieval, was found to obtain the smallest amount of information about both the target and non-target as expected. Regarding accuracy the FR and the FIND was expected to provide more accurate person descriptions than the target and non-target than the DVI. This hypothesis was supported.

Setting details were expected to be recalled at higher rates in the FIND condition compared to the DVI and FR as the MRC component of the FIND may allow for cue overlap to facilitate recall of setting details alongside person descriptions in a narrative format these were found to be recalled in higher quantities in the DVI and FIND than in the FR. The amount of setting details recalled did not differ between the FIND and DVI.

All setting details recalled in the DVI were exclusively reported under the only open prompt the DVI contains 'any additional details' which appears at the end of the form. Participants who completed this part of the form appeared to use it in a manner expected of a FR by using the space to describe the experience of the experiment in a narrative format, similarly in the FIND details exclusively appeared in the MRC facilitated FR section where the narrative produced surrounds the exposure experience. It is reasonable to suggest that participants, having completed the majority of the very in depth DVI form it is reasonable to suggest that participants completing a DVI may have a better understanding of the amount and level of description the experimenter aims to gain and thus provide more detail. All person description details reported here were repetitions of previously stated details and thus did not contribute to the score. It may also be that having spent time focusing on recalling the target person that the setting information available was easily retrievable as memory traces were activated. If this were the case, then Setting information would be expected to be higher in the FIND than the DVI as the FIND uses tools thought to facilitate recall by enhancing cue-overlap such as an MRC component.

The WMM suggests that unattended memories are not processed in the Episodic Buffer and therefore not bound into the more cohesive memorial representation resulting from this processing. However, the higher rates of recall in the FIND and DVI compared to the FR show facilitation of these inattentive memories to be possible. According to the Encoding Specificity Theory this is due to cue overlap between the cues provided during retrieval and cues encoded during exposure to the stimuli (Tulving and Thompson, 1973) initiating a spread

of activation (Anderson and Reder, 1979). The idea that cue overlap is facilitative in inattentive memory suggests some associations between units in memory are present despite a lack of binding in the Episodic Buffer increasing cohesion (Baddeley, 2000, Tulving and Thompson, 1973).

Associations or memory traces for unattended information may be weaker and more fragmented while still being associated with the larger more cohesive unit of memory holding information that was attended to and processed in the Episodic Buffer (Anderson and Reder, 1979; Baddeley, 2000). Thus, it may be more difficult to retrieve unattended information without facilitation providing an opportunity for cue-overlap to trigger a spread of activation allowing the retrieval (Anderson and Reder, 1979; Baddeley, 2000; Tulving and Thompson, 1973). Therefore, the findings of the study presented in this chapter suggest some association between memories for the unattended confederate and for of the holistic experience.

This also supports the idea proposed by the WMM that the linking of information in storage is not solely down to the Episodic Buffer. Indeed, the WMM suggests that the Central Executive has responsibility for the eventual storage of information in memory. Therefore, associations can be created between information not just in the Episodic buffer but also in the Central Executive, although such memory traces would be weaker due to a lack of Episodic Processing (Baddeley, 2000). The Associative Network Model (Anderson and Reder, 1979) suggests that both large cohesive and well linked units of memory and smaller more fragmented units of information in memory are held in a network with associations or links between them. The strength of these links may determine the success of cue-overlap in facilitating retrieval through a spreading of activation. This spreading of activation results in recall within a network of memory where both strong cohesive units containing various pieces of information bound together as well as smaller more fragmented details (Anderson and Reder, 1979; Baddeley, 2000; Tulving and Thompson, 1973).

The finding that the DVI obtained more information than the FIND indicated that there may be some value in non-leading, generic, direct and option-posing questions. However, although the DVI produced more information it was found to produce the least accurate information. It is important to consider which is the priority for investigators. Investigators ideally aim to gain as much information as possible while keeping errors to a minimum. With the known link between inaccurate witness memory for persons (discussed in chapter 1) and

mis-carriages of justice it is pertinent to ensure accuracy of evidence be as much of a priority in the collection of witness evidence as the prevention of contamination is in the collection of forensic evidence. Although the DVI produced more information the mean difference in accuracy between the FIND and DVI was higher than the mean difference in amount recalled between the FIND and the DVI suggesting the FIND to be the better method overall and a promising facilitative tool. Future research may examine the appropriateness of various types of option posing and directive prompts in person descriptions in order to further improve upon this first iteration of the FIND. For example, a future re-coding of the data may reveal commonalities in the question types associated with erroneous details obtained within the FIND and DVI. This may then inform the further development of the FIND through the addition or removal of prompts based upon knowledge gained.

The DVI and FIND provided a good testing ground for the hypotheses surrounding the effect of attention upon participants' abilities to recall person descriptions due to their specific design features being focussed on person descriptors primarily. Experiments 1-3 have focused on measuring aspects of retrieval under different encoding conditions and while comparability of findings is limited by paradigm shifts and variations in stimuli and retrieval tasks commonalities can be observed in the findings. In Experiment 3, as in Experiment 1, inattentive witnesses are seen to benefit from memory facilitation techniques in a manner similar to attentive witnesses with higher levels of recall being achieved through the use of facilitation techniques. In addition, Accuracy across conditions is generally high supporting the idea that inattentive witnesses can be capable and reliable providers of accurate information given a good quality recall opportunity. Indeed, the accuracy of inattentive witnesses, like attentive witnesses was as predicted at its lowest in the DVI condition potentially due to the high concentration of closed and option posing questions. The within-subjects design of the encoding phase facilitated by the confederate delivered instructions in the current experiment appears to have clarified observed differences between recall for attended and unattended persons.

The use of a video stimuli increased the eco-logical validity of the stimuli presentation phase but also decreased the level of control available over stimuli. To address limitations resulting from this additional controls were put in place through the use of a dress code and coding rules. For example, Testing took place over 6 testing days confederates made efforts

to ensure a consistent appearance and temporary features such as facial acne were not coded in order to ensure consistency across sessions. Although much effort was made to ensure equal memorability across confederates and testing days it is difficult to rule out any variations unaccounted for in a live environment. In addition, the live environment presents challenges in maintaining environmental consistency. While the same recruitment areas and testing rooms within the library were used features such as external noise varied although was not excessive.

The improved eco-logical validity of stimuli using a live environment may have aided the observability of attention-based differences as the requirement to view a video screen may induce a kind of framing effect in which all stimuli on the screen is more likely to be processed as a holistic episodic memory representation. The use of video stimuli is not only commonplace within the eyewitness literature but is also used in attention-based paradigms such as when examine change blindness suggesting selective attention within the framed video scene to be possible but less effective than in a live environment. Therefore, it may be that the effects of inattention can be induced via video stimuli as seen in Experiment 2 whereby those participants paying deliberate attention to the target recalled less about the non-target in a manner similar to the weapon focus effect. This effect of attentional focus was also seen to extend to accuracy in Experiment 3 with less accurate recall for the unattended confederate(s) although comparisons are limited by methodological changes.

To conclude, the findings of the current experiment suggest that inattentive witnesses may be reliable providers of accurate information, given supportive retrieval techniques are used this can be seen in the findings with the DVI eliciting the highest recall and the FIND producing higher than FR. However, a serious concern is that the DVI may also be more susceptible to error because it makes use of highly specific question types. Attended Targets were recalled better than unattended Targets, however, recall for both was increased using the DVI form and the FIND form above the standard set by FR. Although the DVI provided more information, the Find provided more accurate information although not by a significant margin. The findings, therefore, suggest that both the FIND and DVI are beneficial, but the FIND requires further development to become a viable alternative to the DVI, although as a first iteration of the tool these findings are considered promising with room for improvement. This methodology provided a good vehicle to examine the research questions surrounding

attention within a live scenario with a reasonable expectation of control due to the use of the script, dress code and limited exposure time. However, the resources required to conduct the experiment meant that a live follow up of was not achievable within the scope of the current thesis. Thus, the final experiment could not deliver the instructions in the same manner and so further paradigm shifts had to be made to accommodate instructions being delivered within the stimuli. Experiment 4, therefore, aims to build upon this by examining inattentive and attentive memory using a between-subjects design allowing for the attentional manipulation to be delivered within the stimuli.

## Chapter 5: Examining The Effectiveness Of The MRC In Gaining Additional Fine And Coarse Grain Descriptors Beyond Initial Free Recall Reports.

‘Sometimes you will never know the value of a moment until it becomes a memory.’ Dr. Suess

Experiment 4 examines memories for a person depicted as intentionally missing but safe and well, reflecting the fact that voiding detection with a degree of intentionality is not uncommon in missing adult cases (Stevenson, Parr, Woolnough, and Fyfe, 2013). Mock witnesses were aware of the target person’s ‘missing’ status (attentive condition) or unaware of this status (inattentive condition). Attentive and inattentive witnesses were exposed to the same video stimuli depicting a student’s journey through a university campus. One static scene within the video was edited to show attentive participants a missing persons poster while inattentive participants viewed a missing dog poster. Following this ‘Lucy’, the target depicted in the missing persons poster, appears in a coffee house scene. Through the use of the edited scene instructions are delivered within the stimuli material as in Experiment 3 without directing witness attention within the target scene. As the use of confederates was extremely resource intensive the shift to a between-subjects stimuli presentation was necessary to facilitate the instruction delivery within the stimuli presentation however the differences in encoding experience of mock witnesses were restricted solely to the poster scenes facilitating the (in)attentional encoding manipulation.

The amount, accuracy and grain size of recall provided by attentive and inattentive participants about the target is examined in an immediate FR task providing a baseline measure of retrieval. The effect of additional facilitation in a secondary retrieval attempt aiming to improve upon initial recall through the provision of facilitative cues is then examined in a follow up MRC task. Additional retrieval attempts beyond the first are of interest because witnesses often give an initial account prior to engaging in a formal interview. The FR is therefore used to represent an initial account commonly given by a witness prior to engaging in an interview or the use of and SAI being authorised (Gabbert et al., 2017, College of Policing, 2018).

Experiment 4 also aimed to re-examine the usefulness of the MRC component and to acknowledge and address doubts over the appropriateness of MRC for use with inattentive

witnesses as well as the potential for a superiority or inferiority effect of a singular component in skewing observations of performance in examinations of the SAI and FIND which both contain an MRC component. The impact of the MRC is therefore directly relevant to the usefulness of the SAI and the FIND with inattentive witnesses as both contain an MRC task including the use of generic cues. While future research may investigate the contribution of the remaining components of the SAI and FIND, the MRC was chosen as a starting point for further examination due to concerns regarding whether the WMM gives an inaccurate interpretation of inattentive memory. If this is the case, then the MRC component may be of limited use and particularly problematic for inattentive witnesses. This is because the WMM proposes that unattended information does not undergo episodic binding resulting in a lowered ability to activate cues required for retrieval of additional details (Anderson and Reder, 1979; Baddeley, 2000; Tulving and Thompson, 1973). This would suggest no gain in recall amount should be expected of inattentive witnesses using MRC. However, Experiments 2 and 3 suggest early memory facilitation opportunities are more beneficial than an early recall opportunity without facilitation, such as in the FR, for inattentive witnesses as well as attentive witnesses showing the facilitative techniques increasing the amount recalled even for unattended information.

Indeed, there is reason to suggest that inattentive witnesses may respond well to MRC tasks within the SAI and the FIND due to the generic nature of the cues provided allowing for more specific self-generated cueing to occur in a manner which is more witness compatible than interviewer generated cues (Wheeler and Gabbert, 2017). Although, this has not yet been empirically tested. The initial FR attempt used prior to the MRC may further induce elaboration and the use of personal cue generation based on the witnesses' original recall during the MRC.

Experiment 4 aims to address the following research questions a) can additional retrieval opportunities enhance the quantity or accuracy of information recalled and b) are there differences in the grain size of details provided by attentive and inattentive witnesses. It was hypothesised that all witnesses would recall more coarse grain than fine grain information in the FR. It was also predicted that attentive participants would recall more fine and coarse grain information than inattentive participants and be more accurate. It was further predicted that the MRC would increase the amount of fine grain information recalled

but only for attentive witnesses. Finally, it was predicted that attentive participant recall in the MRC condition would be more accurate than inattentive participants' recall.

### Method

#### Design:

A 2 (encoding video: attentive instruction v. inattentive instruction) x2 (grain size: fine, coarse) between-subjects design was used with retrieval being examined in both a FR and MRC tasks. Dependent variables were a total number of fine and coarse grain details about the target recalled and accuracy of these descriptions.

#### Participants:

A total of 50 participants including 37 females and 13 males were recruited from Abertay University's staff and student population using convenience sampling. The mean age of participants was 35 years old, ranging between 19 and 56 years old. Conditions were assigned randomly. One participant from each of the encoding conditions was removed from analysis due to showing continual evidence of unconscious transference (See Ross, Ceci, Dunning and Toglia, 1994a: 1994b) This was consistently applied as an exclusion criterion across studies to maintain condition manipulations. Both participants fall out-with the condition norms with the recall of the intended target being floor level but overall recall falling within sample means.

#### Materials

##### *Stimulus video:*

Two similar videos were filmed for the experiment. The only difference is whether a poster (featuring a photo of a target, with the words "Have you seen Lucy?") is presented at the start of the event. The scenes that were consistent in both videos will be four relatively static scenes (camera and performers in a seated position) and four scenes involving movement. The event will be silent and neutral in the content, featuring an actor walking around the University campus. Content of the video is in adherence with a parental guidance age limitation.





Figure 7: Still from stimulus video used in Experiment 4

*FR task:*

The FR instructions requested participants to Report Everything they could remember about the event while attempting to be as accurate as possible and avoid guessing. The task itself was like that used in Experiment 1 (see Experimental Chapter 1 materials section). One important difference between the FR task used in Experiment 1

and the current study is the addition of prompts such as ('The people and objects in the foyer', 'The people and objects in the coffee room' and 'The person from the missing person poster'). These were used in order to ensure the witnesses provided information about the target from the coffee scene rather than from the poster scene in the attentive condition and to ensure witnesses in the inattentive condition new which scenes were of interest.

#### *MRC task:*

As described in Experiment 1 with wording adapted to suit the scenario used in the stimuli video of the current study inclusive an optional eye-closure instruction. With the addition of the same prompts used in the FR ('the people and objects in the foyer', 'The people and objects in the coffee room' and 'The person from the missing person poster').

#### *Procedure:*

Following informed consent being gained, participants viewed the stimuli video then were asked to complete a retrieval booklet about their memories for the clip. The booklet contained a FR with follow up prompts and an MRC with the same follow up prompts. Participants were instructed to work through the book page by page, and while they were permitted to look backward through the book, they should not look ahead, this ensured the MRC instructions were not viewed until after the FR was complete. Participants completed the booklet under no time limit under the supervision of the experimenter who was available to answer questions. Participants were thanked for their participation and fully debriefed.

#### *Coding*

The coding scheme used was consistent with that used in Experiment 1 and 2. Ten percent of the sample was then subjected to intercoder reliability checks. All details were coded independently by two coders with 97.2% agreement with a finalised code being constructed from this inclusive of all details bringing agreement to 100%. Details found to be inconsistent included descriptors being considered too vague or subjective being included

(e.g. she appeared shy), these details were not included in the final analysis. The maximum possible amount that could be retrieved about the target and non-target according to the finalised and agreed upon coding scheme was 24.

### Results

Recall scores for attentive and inattentive participants across FR and MRC conditions were awarded one mark for each detail reported. If a detail had been reported by a participant in both the FR and subsequent MRC task, it was only scored once and contributed to the FR score. The minimum amount of details recalled about the Target (Lucy) was 0 and the maximum was 24.

#### Manipulation check

The number of participants in both the attentive and inattentive condition able to identify the target character in the café as being the person depicted in the missing person poster was consistent regardless of encoding condition with 31.6% of attentive and 31.6% of inattentive participants stating in their recall that the person appearing in the café was the same person as in the missing person poster. This suggests spontaneous recognition was not dependent on whether the poster was viewed before or after exposure to the target person within the café scene. This was not found to be significant in chi-square tests ( $X^2(1, 38) = .000$ ,  $p = 1.000$ ).

## Number of details recalled

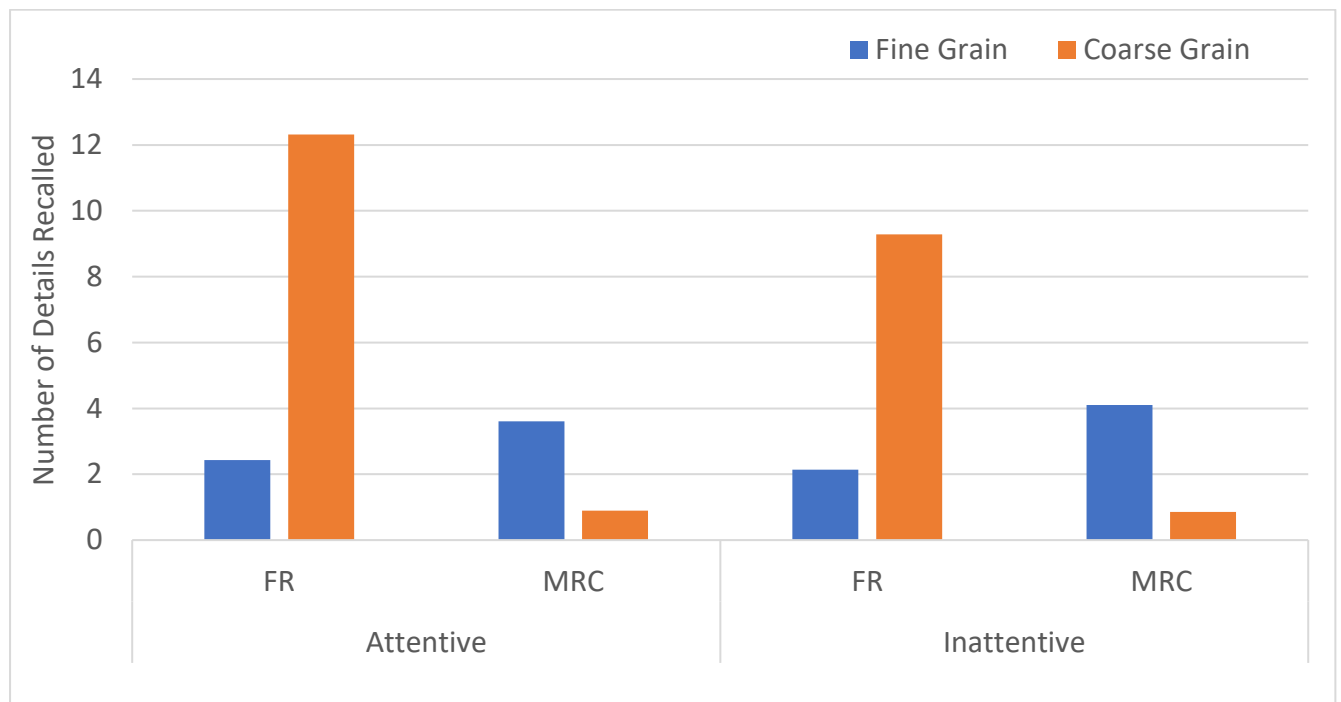


Figure 13: Mean number of details recalled in Experiment 4

Figure 13 shows the findings relevant to the quantity of information recalled. A 2 (Encoding Instruction: Attentive v. Inattentive) x 2 (Grain size: fine v. coarse grain) mixed analysis of variance was conducted to examine differences in mean number of fine and coarse grain person descriptors recalled. The main effect of encoding video was not found to be significant ( $F(1,47) = 231.516$ ,  $p = .227$ ). The main effect of the within-subjects factor, *Grain size* was found to be significant ( $F(1,47) = 31.782$ ,  $p < .0001$ ), Partial  $\eta^2 = .403$  (medium effect). Observed power = 1.000. The total number of fine grain details recalled ( $M = 9.36$ ,  $SD = 3.64$ ) was lower than the number of coarse grain details ( $M = 12.75$ ,  $SD = 7.01$ ). When examining grain size across retrieval conditions this was observed to interact with the within subjects' factor, retrieval, ( $F(1, 47) = 112.998$ ,  $p < .0001$ ). Partial  $\eta^2 = .022$ . Power = .172. Participants reported significantly more fine grain information in the MRC ( $M = 3.82$ ,  $SD = 2.67$ ) than the FR ( $M = 2.31$ ,  $SD = 1.02$ ) ( $t(21) = 3.678$ ,  $p = .001$ ). However, they recalled more coarse grain information in the FR ( $M = 11.02$ ,  $SD = 6.92$ ) than the MRC ( $M = .88$ ,  $SD = 1.09$ );  $t(28) = 10.139$ ,  $p < .0001$ .

No other interactions reached significance (Grain size X Encoding  $F(1,47) = 2.773$   $p = .103$ ; Retrieval X Encoding significant ( $F(1,47) = 3.051$ ,  $p = .087$ ; Encoding, Retrieval X Grain size ( $F(1,47) = 1.060$   $p = .309$ ).

## Accuracy rates of details recall

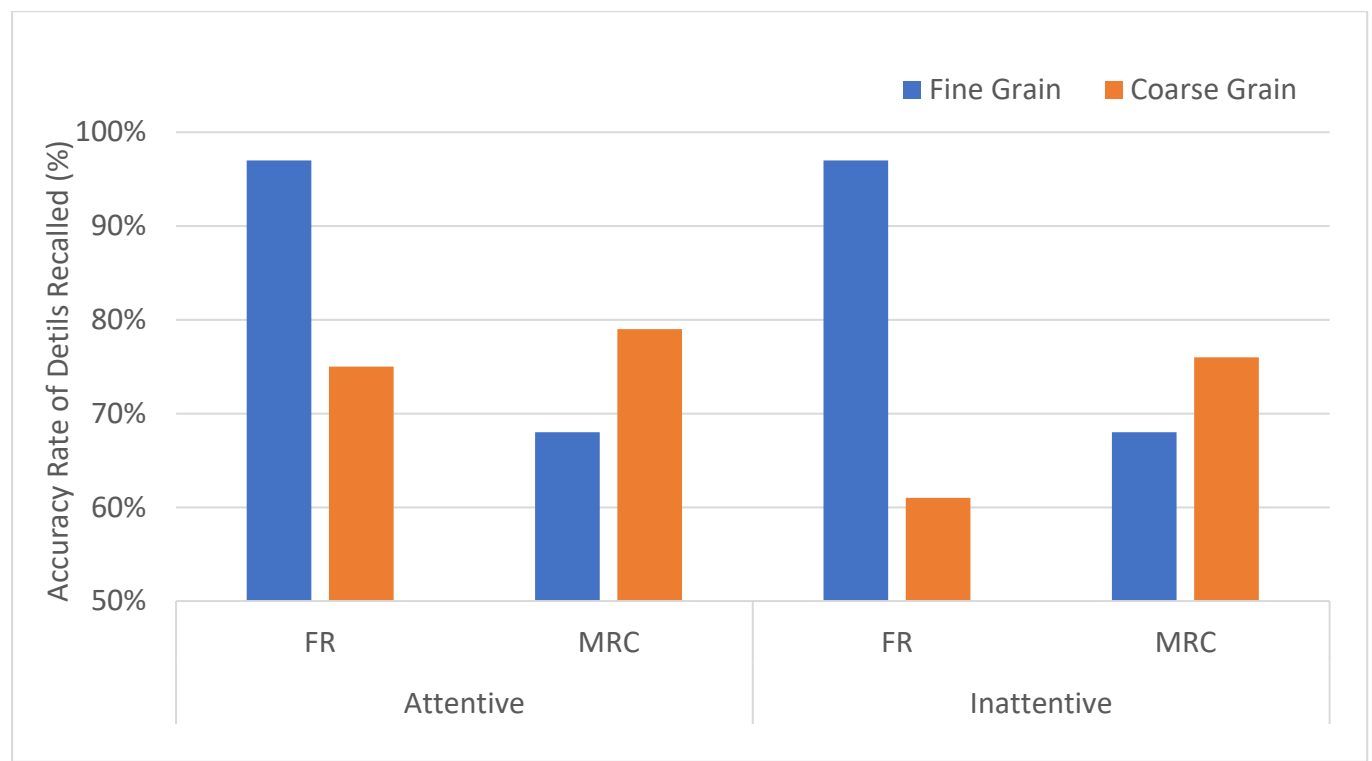


Figure 14: Accuracy rates of details recalled (%) in Experiment 4.

The findings relevant to the accuracy of information recalled A 2 (Encoding Instruction: Attentive v. Inattentive) x 2 (Retrieval: FR, MRC) x 2 (Grain size: fine v. coarse Grain) mixed analysis of variance was conducted to examine differences in accuracy. The main effect of the within-subjects factor, grain size was found to be significant ( $F(1,47) = 18.286$ ,  $p < .0001$ ), partial  $\eta^2 = .379$ , observed power = .985, with participants recalling coarse grain information more accurately ( $M = 84.89$ ,  $SD = 25.33\%$ ) than fine grain information ( $M = 65.4\%$ ,  $SD = 23.09\%$ ).

There was a marginal main effect of retrieval ( $F(1,47) = 4.05$ ,  $p = .053$ ). Partial  $\eta^2 = .119$ . Observed power = .495., with participants showing a tendency to be more accurate in FR than the MRC, although this did not exceed the .05 level of probability.

No other main effect or interactions reached or approached significance (Main effect of encoding ( $F(1, 47) = .602$ ,  $p = .444$ ; Encoding X Retrieval ( $F(1, 47) = .884$ ,  $p = .355$ ; Grain size X Encoding ( $F(1, 47) = .314$ ,  $p = .579$ ; Grain size X Retrieval ( $F(1, 47) = 3.252$ ,  $p = .081$ ; Grain size X Retrieval X Encoding ( $F(1, 47) = .227$ ,  $p = .603$ ).

## Discussion

It was hypothesised that all witnesses would recall more coarse grain than fine grain information in the FR. This hypothesis was supported. In addition, It was further predicted that attentive participants would provide more accurate descriptions, provide more fine grain details and provide more coarse grain details than inattentive witnesses in both the FR and the MRC task. It was further predicted that the MRC would increase the amount of fine grain information recalled by attentive witnesses and that it would produce less accurate information when used with inattentive witnesses. Both of these hypotheses were rejected with Each of these hypotheses were rejected with no differences between attentive and inattentive witnesses' recall regarding the amount or accuracy of fine and coarse grain information recalled.

Indeed, the only hypothesis which was partially upheld was the prediction that the MRC would produce more fine grain information despite only information recalled in addition to that recalled in the FR. Indeed, the bulk of information recalled was provided in the initial FR task while the follow up MRC was able to obtain more fine grain recall however this was the case for both witness groups rather than the attentive witnesses only as predicted.

This may be due to the experiment limited by the strength of the attentional focus manipulation being presented in a video context as only half of the witnesses in the attentive condition referred to the target in the coffee house as being the same person as depicted in the poster during their recollections of the video. This may indicate that some participants in the current experiment did not recognise 'Lucy' appearing in the clip as the target from the poster resulting in the manipulation failing to induce attentional focus onto the target and the lack of encoding differences being observed.

The higher level of fine grain information recalled by participants within the MRC condition shows that it is possible to increase recall of fine grain information through facilitation however the lack of attentional differences suggests the manipulation not to have been successful so the effect of this upon attentive and inattentive participants remains unknown. In addition, When retrieval conditions are collapsed all participants were found to be less accurate in their recall of fine grain details and there was a marginal main effect of retrieval, whereby participants show a tendency to be more accurate in FR than the MRC.

Previous literature suggests that repeat retrieval attempt has a facilitative effect known as hypermnesia (see La Rooy, Pipe and Murray, 2005) in which additional, accurate information can be gained through secondary retrieval attempts. However, this has not been examined in inattentive participants. Unfortunately, the information gained in the follow up MRC was minimal; however, it was seen to be accurate with only marginal differences in accuracy rates between the MRC and the FR. In addition, The MRC may have produced little information, but the information produced was more detailed in nature suggesting the MRC instructions to be useful not only in increasing recall but in reaching the fine grain details not produced in high quantities in the FR. Investigators may bear this in mind when making decisions regarding interview planning taking into account the level of detail they wish to obtain.

The finding that fine grain recall was enhanced by the MRC may have occurred because the MRC requires participants to mentally visualise the stimuli video, thereby increasing overlap between memory cues present at encoding and retrieval (Tulving and Thomson 1973). If the manipulation of encoding had been successful, this would suggest that the WMM appropriately forecasts the treatment of attended information while underestimating the ability of unattended information to create associations within the Episodic Buffer. As it stands, this conclusion cannot be supported, and further research is required as the manipulations effectiveness cannot be confirmed by the findings. The limitations of the current experiment also include the lack of between-subjects' comparisons of the MRC and FR performance, while this design suited the purpose of comparisons of additional information against initial recall, regarding grain size, it would be of interest to examine how the MRC performs as the initial recall task rather than a follow up in terms of the amount of information recalled which is fine or coarse grain in nature.

The current findings may have implications for investigations, with the accuracy being found to be lower for fine grain information. This suggests that caution should be taken when fine grain information is reported by both attentive and inattentive witnesses. While fine grain recall can be prompted using the MRC, as shown by the current findings, it may not be advisable as accuracy was shown to be lower for fine grain details than coarse grain, although this was not related to the retrieval task used. The decision as to whether to prompt further for fine grain information then may depend heavily on investigatory priorities. For example,

in a case where investigators require more information to make progress and leads are slim, prompting for further fine grain recall may serve to progress the case. However, investigators in these cases may then wish to place extra efforts on following these details up with the aim of corroborating them to avoid placing high importance on potentially erroneous information. On the other hand, in cases where an adequate level of information is available from initial reports to achieve investigatory goals, additional prompting for fine grain information may be damaging to the perceived reliability of the witness as any errors made in fine grain recall may reflect badly upon coarse grain recall as perceived by others for example police officers, and juries.

The current findings show no differences in coarse grain information recalled by attentive and inattentive witnesses. Despite the doubts over the manipulations strength this fits well with conclusions drawn in previous studies within this thesis that show inattentive participants can provide relevant and useful information. Thus, further examination of inattentive memories is required as is further examination of the impact of MRC. In addition, the MRC has been shown to be a valuable tool for the extraction of fine grain information as it retrieved additional details even when limited in scoring potential due to the FR task being the primary measure of memory with the purpose of the MRC in the current study being to examine additional retrieval above initial attempts.



## Chapter 6: General Discussion

"Take care of your memories. For you cannot relive them." - Bob Dylan

The current series of experiments investigates both the effect of inattentive encoding upon eyewitness memory, and the effectiveness of various retrieval methods. Presented here is a summary of the experimental findings before considering their implications, limitations of the work and avenues for future research.

Gaining a useful account of events may become more difficult when incidental witnesses are involved due it being unlikely that any effortful attention was paid at the time of encoding. Indeed, The WMM's structure suggests that attended information receives an additional level of processing above that of inattentive information. Specifically, the WMM suggests that while unattended information is processed in the Phonological Loop and the Visuo-Spatial Sketch-Pad no episodic binding takes place in the Episodic Buffer (Baddeley, 2000). This suggests that the storage of unattended memorial information is stored in a more fragmented manner by comparison to attended information which has, according to Anderson and Reder's (1979) undergone more Elaborative Processing producing more effective connections between information stored for later use. Similarly, Tulving, and Thomson's (1973) Encoding Specificity Theory, suggests unattended information likely to be less retrievable as the spread of activation is limited by these weaker connections thereby discouraging retrieval via cue overlap. If the literature discussed represents memory well then inattentive participants should recall less information but have the ability to produce more through the use of facilitative techniques which are direct rather than associative. This calls into question the potential effectiveness of the MRC with inattentive witnesses and suggests that direct generic prompting without the use of visualisation is more effective. The SAI and the FIND both had favourable findings within the current thesis having obtained high amounts of accurate information about both attended and unattended information.

### Summary of Findings

#### Experiment 1

In Experiment 1 participants viewed a video under either full or divided attention conditions with a word generation task being performed simultaneously by those in the

divided attention condition. The word generation task required the resources of working memory to prioritise the use of the Phonological Loop in order to meet task demands. Following a 2-week delay recall was obtained in either a FR or MRC task. It was predicted that participants viewing the video in the full attention condition would report more information about the perpetrator and be more accurate in their recall than those in the divided attention within both recall conditions. This was not supported with no differences found between divided and full attention participants and the manipulation check employed suggested the manipulation was not robust enough to overcome the 2-week delay phase.

It was further predicted that The MRC recall task would produce more information than the FR task in both full and divided attention conditions while producing less accurate information in the divided attention condition based upon the WMM's suggestion that information less well attended to are less well bound in the Episodic Buffer (Baddeley, 2000). However, no differences were found between the FR and MRC. Consequently, all hypotheses were rejected in Experiment 1 with no significant differences in number of descriptors or accuracy of descriptors provided.

## Experiment 2

Using an alternative paradigm, participants in the attentive condition were given prior instructions directing attention towards a target in a mock crime video. In contrast, inattentive participants were given no instructions and were able to self-direct attentional focus within the scene. Memories were reported for attended targets and unattended non-targets using either a FR or SAI. Attentive and inattentive participants were found to recall more about the target than the non-target and to recall less about the setting than either target. In addition, attentive participants recalled less about the non-target than the target. It is suggested that attentive witnesses showed attentional focus for the target resulting in higher amounts and accuracy of details than information about the unattended non-target due to attentional resources being focussed here during encoding. Inattentive participants show memories equivalent to the attentive participants for the target but show a better recall of information about the non-target. It is suggested, then, that participants in the inattentive condition were able to self-direct attention across the scene without being drawn to one

person over another, participants in the inattentive condition may be able to provide information unavailable to attentive participants.

### Experiment 3

In Experiment 3, participants experienced short interactions with a target confederate in the presence of a non-target confederate with whom they did not interact. Following this they reported descriptions using a Disaster Victim Identification (DVI) form, a Form for Individualised Descriptions (FIND) or a FR task. In this experiment, the attention condition was within-subjects, as participants encoded one character in attentive conditions (target) and another in inattentive conditions (non-target). This was achieved during the interaction, by asking one confederate to instruct the participant (attentive: target) to remember details about them for subsequent testing, while the other confederate gave no such instruction (inattentive: non-target).

Overall, and as expected, target information was recalled more than non-target information. For both target and non-target recall, it was found that the DVI obtained more information than the FIND and both of these specialised methods gained more information than the FR. The accuracy rate for was also found to be better for the target confederate, however, no accuracy was seen to be higher in the FR and the DVI. Thus, the tool observed to obtain accurate additional information was the FIND.

These findings differ from the findings of the previous Experiment 2 where participants showed an ability to recall fewer but accurate information about targets, while in Experiment 3 recall about the non-target (unattended) was lower than that of the target. The findings of Experiment 3 suggest that inattentive witnesses may have impairment in recallability for target information. However, these experiments show that there is the potential to improve the retrieval of these witnesses using facilitative techniques such as the DVI or FIND, as well as the SAI used in Experiment 2. With regards to the accuracy measures in Experiment 3, accuracy was found to be higher for the attended target descriptions in comparison to the unattended non-target. These differences were consistent across retrieval conditions.

## Experiment 4

Experiment 4 examined memories for a missing (Target) person with 'attentive' participants aware of their missing status and 'inattentive' participants unaware of their status. Participants recorded their memories about the encoding experience and the target ('Lucy') from the video using a FR initially and an MRC follow up in order to examine additional information gained through facilitation following initial baseline attempts. No differences were found regarding the amount of information recalled by attentive and inattentive witnesses. However, despite the MRC being the second retrieval attempt and coded for original/new information only, more fine grain information was reported suggesting the MRC to be particularly useful in eliciting fine grain information. The quality of recall was further examined in Experiment 4 by introducing the grain size variable. Experiment 4 found that attentive and inattentive encoders provide equally complete person descriptions in terms of the amount of fine and coarse grain information recalled, however, fine grain information was found to be less accurate than coarse grain information recalled. Although Experiments 1 and 4 show no attentional effects the effects of inattention can be observed in experiments 2 and 3 with the attentional manipulation affecting the amount recalled and accuracy of recall about targets. However, further research is required to gain a clearer picture of how best to retrieve unattended memories through facilitation.

## Encoding

Across Experiments 1 and 4, main effects of encoding condition were not found to consistently show significant differences in the amount or accuracy of information recalled as expected. It is therefore pre-mature to suggest any firm conclusions prior to further research into inattentive witness encoding. The lack of consistency is due in part to various limitations and paradigm changes. This was the result of the novelty of the research into inattentive witness memory and the lack of an existing paradigm. However, some evidence of differences in the amount of information recalled about attended targets and unattended non-targets can be observed.

In Experiment 1, no differences were observed between participants in their recall of a mock crime video following either divided or full attention. This is thought to be primarily due to delay. As participants in Experiment 1 recalled less than a half of the target information

available regardless of condition the very low overall recall may have contributed to the difficulties in observing encoding and retrieval task effects. In addition, the word generation task used to divide attention was seen to be ineffective in the manipulation check with no memory differences between divided attention and full attention participant's recall despite high numbers of words being generated showing engagement as well as no negative correlation with recall which would have implied a lack of difficulty due to the task. It may also be the case that differences were less observable following delay than they may have been in an immediate test as it was suggested in Chapter 2 that the null findings may have been due to low participant recall masking group differences. Some features of the design may have contributed to the low memory scores with the manipulation appearing to fail. There was a 2-week delay between video exposure and retrieval during which time, memory traces may have decayed. In addition, the video was short, poor-quality and non-audio, thus encoding and retention of information may have been impaired in both full and divided attention groups. Together these features may have produced poorer memory in the witnesses. Floor effects and the lack of differences being observed is thought to be primarily due to delay which is removed in follow up experiments. In addition, the paradigm shift between experiments 1 and 2 from the divided attention paradigm to a design similar to incidental learning paradigms is thought to provide a better representation of an eyewitness experience with attentional resources being directed by instruction or self-directed rather than impaired by task demands Experiment 2 aimed to consider these issues more carefully in the design of the experiment, therefore, a paradigm shift took place with the focus moving to experimental instruction to direct rather than disrupt encoding and attentional processes and without impairing perceptual awareness.

Experiments 2 and 3 found differences in the amount of information recalled about attended targets and unattended non-targets. In Experiment 2, recall was higher for target detail than for non-target details reported with higher accuracy in target recall than non-target recall. In addition, attentive participants recalled fewer details about unattended targets than inattentive participants. This is thought to be due to attentive witnesses focusing attentional resources upon the target to the detriment of encoding of non-target details in a manner which is inattentive. Inattentive condition participants on the other hand were able to self-direct attention without the influence of the attentional instruction and with no

differences between the number of target details recalled suggests a spread of attention across the scene.

Accuracy differences observed in Experiment 2 are more complex with attentive and inattentive participants recall about the target being more accurate than the non-target while non-target accuracy was higher in recall by inattentive witnesses in comparison to attentive witnesses. It is suggested that attentive witnesses have impaired recall for the non-target due to attentional focus while a smaller contribution towards inaccuracy in memories for unattended memories may be due to post encoding priorities with order of person description retrieval being witness selected and reports about the better recalled person being given first allowing slightly longer delay for the worse recalled information. This limitation was corrected in Experiment 3 by counterbalancing the order of retrieval with half of participants recalling the non-target first and half recalling the target first. As well as confederate being counterbalanced across target and non-target roles.

Consistent with Experiment 2, Experiment 3 found higher accuracy for targets over non-targets. This suggests that rather than impairment being caused by inattention, it may be that focussed attention has a cost regarding non-central information being lost, with attentive participants being less accurate in non-target recall in Experiment 2 and unattended targets in Experiment 3 being recalled with less accuracy. When told to pay attention to one target as a priority, recall for others may suffer while participants under no instruction to attend (e.g., Exp.2 inattentive condition) appear to have access to a wider range of information.

The differences between attentive and inattentive participants as proposed by the theoretical research question is perhaps best represented in the findings of Experiment 3 in which witnesses recalled more information and were more accurate in their recall about attended confederates than unattended confederates. It was out-with the scope of the current thesis to repeat the live research paradigm due to the high demand upon resources, thus, experiment for aimed to imitate the design within the constraints of using video stimuli.

Experiments 1 and 4 showed no differences between attention conditions. However, in each of these experiments it is thought that the manipulation may not have been robust enough for differences to be observed. This is suggested to be due to the delay phase in Experiment 1 and due to a manipulation failure in experiment 4 in which many attentive

participants did not recognise the target as being the missing person from the poster despite noticing and reporting on the target as an individual in their recall.

Experiment 4 is limited by the presentation of the target centrally within a busy scene. While central presentation generally increases the amount of attention paid, the influence of visual perception can be overwhelming. Indeed, Firth, Perry and Lumer (1999) showed participants may be less able to respond to central stimuli, particularly when distractors are within a close visual angle because attention is being lured elsewhere. This appears to have been the case in attentive witness memories for unattended targets in both experiment 2 and 3 (all witnesses in Experiment 4 being 'attentive' to the scene). This was controlled for in Experiments 2 and 3 with targets and non-targets alike being presented centrally. Peripheral complexity of the coffee house scene alongside the potential lack of recognition of the target confounding the manipulation may account in this case for the failure to observe differences between attentive and inattentive witnesses.

Frequent saccades without awareness provides a method of information uptake without conscious attention being paid (Firth, Perry and Lumer, 1999; Posner et al. 1980), as observed in visual search tasks for a familiar stimulus (Cohen, Ward and Hennessy, 2004). The information gained through these saccades, following processing may induce attentional switching by grabbing attention and directing it towards stimuli deemed important (Tsotsos, et al., 1995; Itti et al., 1988). This provides an explanation for the recall observed by those who were either in the inattentive condition or for those whom the attentional manipulation was not effective for.

Those witnesses who did recognise the target as being the missing person in Experiment 4 may have shown differences unobservable without a larger number of participants processing the target attentively. When attention is grabbed in the manner described by Friedenberg, (2013), choice is not always involved. 'Forced seeing' can be induced whereby the features of the stimuli demand attention (Friedenberg, 2013) as seen in the 'weapon focus' effect, (Kassin, Tubbs, Hosch and Memon, 2001). A stimulus may 'grab' attention for a variety of reasons such as its apparent salience, importance, or novelty.

Indeed, the displays of differences in recall due to attentional manipulations in Experiments 2 and 3 may imply similar effects to forced seeing as the instructions may work to prime the witness to make use of prospective memory; an awareness during encoding with

an intention to remember the experience later (Brandimonte, Einstein, and McDaniel, 2014). Unattended stimuli in flanker tasks show features of a visual scene dissimilar to the holistic environment to be processed without awareness (Millar, 1991; Harms and Bundesen, 1983; Eriksen and Eriksen, 1974; Driver and Baylis, 1989; Paquet and Lortie, 1990). This suggests that a person in the environment is then subject to some level of automatic processing in terms of basic features such as size, colour, motion allowing for a reallocation of attention may occur. (Eriksen and Eriksen, 1974; Firth, Perry and Lumer, 1999). Indeed, Familiar faces are shown to be rapidly recognisable from afar, from varied angles and in varied contexts (Bruce and Young, 1986, 1998). This also supports the potential for the retrieval of information about the targets by inattentive participants.

Through this process unattended information receives a minimal level of processing to determine whether attention should be allocated towards the stimuli or diverted away during future perceptual cycles (Jensen et., 2012, Itti, Koch and Neibur, 1988).

The weapon focus effect demonstrates a scenario in which retrieval ability is impaired due to attention being focussed in a particular location. In a similar way, participants in the current series of experiments may have attention focussed on stimuli other than the person being described (e.g. unattended targets) thus, it may be that the allocation of attention is the cause of the weapon focus effect, in which case we would expect to see similar impairments in inattentive witnesses as observed in the findings of Experiment 3 and within the attentive condition of Experiment 2.

The Easterbrook's Cue Utilisation Hypothesis (1959) suggests that the emotionality of weapon exposure may be the cause of these effects. However, r, these effects were found by Pickle (1998) with unusual objects regardless of threatening behaviour, therefore suggesting the novelty of the item allows it to grab attention in much the same way as its perceived threat (Linden et al., 1999). Given the findings discussed here, it may be that inattentive participants can produce accurate recall in the current thesis because no threat was present to inhibit them, nor was any attention-grabbing stimuli with targets being dressed in a manner in keeping with the environments depicted which were familiar everyday scenes for participants. Peripheral information such as that related to non-target characters are therefore less likely to be ignored in favour of information deemed dissimilar, unexpected or



unusual within the environmental context as would be expected in inattentive experiences of witnessed events.

Fuzzy Trace Theory suggests preserving cognitive resources heuristics are used, favouring shallow processing where possible and reserving cognitive energy. When stimuli is important or salient to us, deeper levels of processing are afforded. Heuristics risk schema-based intrusions affect the accuracy of information provided (Rubin and Kontis, 1983), for example, when a stimulus is dissimilar (Eriksen and Eriksen, 1974; Firth, Perry and Lumer, 1999), unusual (Pickle, 1998) or possesses another 'reason to remember' (Bromby and Hall, 2002) this may be due to a novelty/oddball response (Linden et al., 1999). This refers to the orientation of attention by a novel or uncommon stimulus. (Linden et al., 1999).

By definition inattentive memories, having received less attentional processing, according to Fuzzy Trace Theory suggests that memories resulting from inattention are likely to contain mostly gist level details (Brainerd and Reyna, 1990; Craik and Tulving, 1975). This would suggest that accuracy would be higher in inattentive witnesses while being less detailed. Although some doubts exist over the manipulation in Experiment 4, the manipulation failure would not affect the finding that inattentive witnesses were seen to produce fine grain information (although this was also found to be less accurate than coarse grain information). This suggests more than gist level details to be available. Indeed, in Experiments 2 and 3 information deemed forensically relevant by the coding scheme is seen to be retrieved at relatively high levels when memory facilitation is available.

In addition, other memory theorists agree that with poor encoding comes poor retrieval as suggested by the levels of processing framework regarding the depth of processing (Craik and Lockhart, 1972; Craik and Tulving, 1975) and the breadth of processing' (Anderson and Reder, 1979). Providing that manipulations were successful, the lack of difference in general accuracy with the exception of the DVI suggests that retrieval facilitation plays a larger role in maintaining accuracy despite encoding differences. Indeed, open question formats may provide better retrieval opportunities than closed question formats with the SAI, FIND and FR all performing well regarding accuracy rates. It may be that the retrieval methods used facilitate accurate memory more so than the recognition tasks used in traditional laboratory-based memory studies (Lindsay and Johnson, 1991). To summarise,

the findings support the statement that shallow processing results in memories, relatively robust in accuracy (Brainerd and Reyna, 1990; Craik and Tulving, 1975).

### Retrieval

Within the current thesis the FR and MRC as singular memory techniques were examined to investigate their usefulness with inattentive witnesses. While questions remain over the effectiveness of the MRC in this context Experiments 1 and 4 revealed no suggestion of facilitative benefit but also contained no suggestion of concern over the use of the MRC as suggested would be that case by the interactive theoretical underpinning of the WMM and the Encoding Specificity Theory suggesting unattended information to be more fragmented in its storage.

The accuracy in the MRC of Experiment 4 was found to be lower however this is potentially explained by the MRC obtaining more fine grain than coarse grain which is seen to be of lesser accuracy with fine grain information being less accurate than coarse grain information in both retrieval tasks while more frequent and claiming a higher proportion of additional recall gained in the MRC. Investigators may bear this in mind when making decisions regarding interview planning. With current guidelines suggesting that repeat interviewing has a facilitative effect known as hypermnesia in which additional information can be gained through secondary retrieval attempts. These results suggest that while the additional information gained is more likely to be fine grain in detail and less accurate. Therefore, the use of the MRC may be beneficial in cases where leads are desired and required for the progress of the case however they may be inhibitive if erroneous in cases where corroboration is not available.

In Experiment 2, the SAI was found to increase recall beyond that observed using the FR; while Experiment 3 finds that the DVI obtained more information than the FIND with both obtaining more information than the FR. These findings suggest that memory facilitation tools can increase recall in both attentive and inattentive witnesses while maintaining accuracy for coarse grain information. The accuracy of the SAI and FIND was observed to match that of the FR in both attentive and inattentive witnesses while the DVI was seen to have significantly lower accuracy than both the FR and FIND. This suggests that the open recall format of the FR, SAI and FIND is preferable to the closed question structure of the DVI however, further

examination of the contribution of the MRC, found within both the SAI and the FIND in the recall of inattentive memories is required.

Retrieval tools performed generally as expected with specialised and facilitative methods (SAI, DVI, FIND) used in the current series of studies providing more information than less facilitative methods (FR). However, It was surprising that the DVI outperformed the FIND in Experiment 2 by obtaining more information overall due to the closed question structure used. This suggests that the FIND may need refinement and further development prior to it's use in real word investigations although the results are generally promising. The FIND provides significantly more information than the FR although mean accuracy rate did not significantly differ. With further refinement, laboratory testing, further development and field trials this technique may be of use to officers investigating mass disaster cases and potentially individual missing person cases. An additional use may be during criminal investigations when facilitation specifically related to person descriptions are required.

It may be that differences in the amount of information was partially due to the inclusion criteria in the coding scheme being based on the inclusion criteria of information in the DVI form thereby favouring the DVI in the coding stage. The coding was done in this way to ensure that the method of memory retrieval was compatible with the Post-mortem DVI forms which descriptions would be required to match up to for identifications to be made. Future research may wish to make use of a more inclusive coding system that accounts for the additional information which may be available from the FIND if the coding scheme were more flexible. The second intention of this criterion was to ensure information gained was forensically relevant, however, the restrictive nature of the DVI may indeed inhibit the inclusion of information not directly prompted with a lack of open prompts in favour of closed prompts in the DVI design.

Police officers are under pressure to prioritise their resources and thus, inattentive witnesses, are generally and rightly, not seen as key witnesses in an investigation and may not be asked to provide statements. However, using methods of information gathering such as the SAI and the FIND form information can be collected while officers remain free to focus their time on key witnesses. A successful example of this type of initiative can be seen in the SAI field studies described earlier (see Hope et al., 2011). Future research is needed to investigate further comparisons between the DVI and the FIND. The FIND is a novel technique

so requires further research particularly regarding the accuracy of the FIND by comparison to other retrieval techniques, however the high quantity and accuracy rates of recall shown in Experiment 3 suggest this may be a useful addition to an investigators tool belt of techniques.

Future research should also consider other methods to test the effectiveness of the form. For example, in Experiment 3, we ask participants to describe confederates who are strangers to them. Future research should examine memories for known individuals such as partners, family members and friends to better reflect the retrieval processes of those providing descriptions of missing persons.

### Limitations and future directions

Further work must be done to refine a working paradigm for the examination of attention in a in episodic memory relevant to eyewitnesses and to combat the difficulty of manipulation checking with inattentive processing for basic featural information and semantic meaning risking the effectiveness of manipulation by causing attention shifts during stimuli presentation (Paquet and Lortie, 1990). To avoid such effects the incorporation of known and unknown details in the experimental manipulations aims to prevent goal related attentional switching in a top down manner while controls put in place regarding targets not standing out or being of 'average memorability' hope to prevent attentional switching in a upon bottom up manner.

With information being processed for features and semantics, if details are deemed, in a bottom up manner, to meet a threshold level of saliency or relevance then attention may switch via this bottom up mechanism with attention being lured to a new location thereby initiating top down attention to be paid to the peripheral stimuli now being deemed salient or relevant (Jensen et al., 2012).

Limitations of the experiments presented are discussed within experimental chapters (e.g., divided attention manipulation, use of between v. within-subjects designs, use of video v. live scenarios). The current thesis made use of four written memory retrieval techniques but did not examine how retrieval would be affected by verbal interviews the. These are used widely, such as the PEACE/PRICE model used in the UK, the CI or indeed NICHD interview used with child witnesses (La Rooy, Brubacher, Aromäki-Stratos, Hershkowitz, Korkman and

Stewart, 2015). The current thesis highlights the usefulness of the SAI for gaining information which most likely would be lost.

Future research into the effectiveness of verbal interviews in promoting recall of unattended information, for example, It would be interesting to see whether verbal interviews further promote memories for unattended information, perhaps due to the social components such as rapport building or whether a negative effect on memory would be observed. Previous research within UK policing shows that while officers may have the best of intentions and aim to conduct a skilled and appropriate PEACE interview, many are undertrained and under skilled in investigative interviewing (ACPO, 2004; Clarke and Milne, 2001; Milne, 1999). Indeed, Clark and Milne (2001) find that the majority of police survey respondents in the UK stated they do not use the majority of the CI techniques due mainly to limited time and resources.

The use of verbal interviewing methods may also provide gains in terms of ecological validity allowing for recommendations to be made that have implications for verbal interviewing strategies used in the real-world. A concern related to suggestibility is the release of person descriptors within witness appeals. Guidelines for investigative interviewers aim to prevent suggestibility issues arising by avoiding the introduction of information not previously discussed by witnesses when possible however witness appeals often contain this information. It is important to understand susceptibility to suggestion in inattentive witnesses as they are often the target of appeals. For example, in the Joanna Yeates case presented (see general introduction) exemplifying that not only is this a suggestibility issue but it is also an example of indirect memory conformity. 'Known' information presented within appeals has come from the perceptions of another whether that be a co-witness, CCTV operator or police officer, thereby exposing new witnesses to any flaws within the description presented. In addition, if this information is then reported then investigators may mistake memory conformity for corroboration.

In the current studies stimuli such as videos, and live experiences are used to give a more ecologically valid take on how encoding affect eyewitnesses. It is difficult to make inferences based on the previous research as the stimuli used is often artificial such as card tasks, word tasks and still observational tasks. A video or live event is more ecologically valid due to the movement and action involved, the inclusion of people in the stimuli. Although the

issue of framing is a concern with video stimuli suggesting that more live scenario studies are required although care over control of target memorability is essential.

As well as memory retrieval techniques, more research is required on inattentive encoding effects. Psychological research has provided valuable insight into the reliability of eyewitness memory, advising how best to elicit target information from memory, and predicting when errors are most likely. However, comparisons of 'attentive' and 'inattentive' witnesses are lacking. Inattentive witnesses have received little attention from the research community meaning that the vast amount of knowledge gained about 'attentive' memory retrieval and the variables effecting it may require re-examination with inattentive witnesses in mind where applicable. For example, memory errors such as the acceptance of suggestions, whereby information suggested to witnesses post encoding can become incorporated into the witness' memory for the incident.

Future research should examine the suggestibility and source monitoring of inattentive witnesses as well as their recognition abilities in line-up and identification tasks, it was out-with the scope of the current thesis to examine these known errors. Instead the focus, within the current series of studies was to provide the best, possible retrieval support and experience we were pragmatically able to examine the abilities of inattentive witnesses.

## Conclusion

The pre-requisite need for person descriptions means there is a need to ensure that procedures under the control of the Criminal Justice System allow for all witnesses to provide their 'best evidence' following wither attentive or inattentive encoding. The retrieval of person descriptions especially must be fair and of use in order to prevent miscarriages of justice and to provide effective policing. The evidence of interest in the current thesis, is therefore, the person descriptions obtained. This thesis investigated the ability of mock witnesses to provide reliable descriptions of briefly viewed persons under varying encoding and retrieval conditions.

Overall the findings of the current thesis suggest that inattentive witnesses may be valuable witnesses to the criminal justice system. Despite them recalling less information, at times, than attentive witnesses, this can be facilitated while maintaining accuracy. The findings support the use of the SAI and the FIND. This is because each of these techniques

provided high levels of information in comparison to the baseline FR measure while for the maintaining accuracy. Support for the MRC is less strong with this appearing ineffective in Experiment 1 and only gaining small amounts of additional recall in experiment 4 although this may be information of high value as fine grain recall contributed to the majority of MRC retrieved details not retrieved initially. However, with the literature suggesting with unprompted recall being more accurate than prompted recall (Dent and Stephenson, 1979; Dent and Stephenson, 1979; Bull, 1992; Vallano and Compo, 2011). Investigators should take on board the finding that inattentive witnesses can be accurate given helpful memory facilitation support as well as the finding that these techniques also benefit attentive witnesses however, further research must be conducted prior to firm recommendations being made regarding the interviewing of inattentive witnesses.

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## Appendices

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